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# USSR Report

ECONOMIC AFFAIRS

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## ECONOMIC POLICY, ORGANIZATION AND MANAGEMENT

### LEAD ARTICLE STRESSES KEY ECONOMIC TARGETS

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 4, Apr 80 pp 4-7

[Unattributed article "Lenin's Course"]

[Excerpts] V. I. Lenin considered the increase in the national labor productivity as the most important task in the planned management of the economy and the main condition for the victory of the new social order. The Lenin principle of achieving the highest labor productivity is reflected at the present time in the broad program for increasing the efficiency of national production.

Now, when our country has a powerful economy at its disposal, along with advanced scientific resources, highly qualified personnel, and an enormous accumulation of public wealth, it can solve simultaneously the complicated economic and social problems involving the main goal of the party - an increase in the welfare of the people. In order to solve these problems, as the party acknowledges, the powerful industrial and technical potential created in our country must be used more effectively to increase the national income and the end products that directly satisfy the needs of the population and the entire economy.

The advances made in the national economy of the USSR during the four years of the 10th Five-Year Plan, as was noted at the November (1979) plenum of the CC CPSU and in speeches by party and government leaders, are an indication of the undeviating economic and social development of our country. Also, the CPSU, following Lenin's legacy, evaluates these results critically and is able to uncover shortcomings, direct efforts to solve pressing problems, and mobilize workers to use efficiently all the possibilities presented by socialism, all that is created by the labor of the people.

It was emphasized at the November (1979) plenum of the CC CPSU that our advances in economic and cultural construction and in raising the standards of living of the population could be much larger if the ministries, departments, the councils of ministries of the union republics and leaders of associations and establishments, and state and collective farms would carry out more consistently and persistently the party's policy on improving the efficiency of production and the quality of work, to strengthen the state's planning and labor discipline, and to overcome more resolutely the shortcomings and difficulties present in the economy. The main reason for these shortcomings is that the improvement of the efficiency of production and the quality of work has not been as great as intended by the plan. Many ministries and departments are unable to overcome the forces of inertia and make a fundamental change towards improving the quality and productivity of labor and achieving the best lasting results.

Large and crucial tasks confront the Soviet people during 1980. "The coming year," said L. I. Brezhnev at the November (1979) plenum of the CC CPSU, "is not only the concluding year of the present five-year plan but also the base for the construction of the next plan. This is the year for the active preparation for the 26th Congress of the party. It is precisely from this standpoint that we must evaluate the work performed and the tasks for 1980."\*

The November (1979) plenum of the CC CPSU pointed out the key problems and areas of the economy that are hindering its development and require special attention during the preparations for the 11th Five-Year Plan and the course of the basic directions for social and economic development in the future. Under modern conditions, a primary concern is the organic connection between the achievements of the scientific and technical revolution and the advantages of a socialist economic system, and also the maximum use of the qualitatively new potentialities resulting from the development of science and technology. This becomes even more important since our economy has entered a stage of development in which practically all the increase in production is provided by the growth of labor productivity, which is the decisive parameter for improving production efficiency. And this is possible only on the basis of an accelerated scientific and technological development.

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\*Pravda, 28 November 1979.

V. I. Lenin stressed that "success will come to the one with the highest technology, organization, discipline, and the best machines ...."\* We have done much in this regard. It also must be said that the state of affairs regarding the development and especially the introduction of new techniques and technology does not correspond to practical requirements in several branches of the economy. Some ministries do not carry out the plan for scientific and technological development to the full extent and do not provide the required inventories when producing new types of machines and equipment or introducing new technological processes, which are the most important for saving living labor, improving the efficient use of raw materials and fuel, and increasing the quality of production. In developing new machines and equipment, not enough attention is paid to the improvement of their qualitative characteristics and the reduction of their material and energy requirements.

Ministries and departments must pay greater attention to the improvement of production techniques and technology at operating establishments, of which there are more than 40 thousand in the country. Under these conditions the problem of improving labor productivity can be solved by increasing capital investments aimed at raising the technological level of operating enterprises.

A fundamental technological re-tooling of the USSR economy as the basis for raising its efficiency requires accelerated development in the machine building sector and an increase in the percentage of equipment, whose state and technical level would meet the more complicated problems and the increasing requirements of the modern stage of economic development in the country. In choosing the basic trends and preparing the 11th Five-Year Plan, attention should be paid primarily to an increase in the machine and equipment resources, an economically justified increase in their unit power, improvement of the designs and parameters with regard to special operating conditions, and the development of multi-purpose machines.

Just as important for machine building are a reduction in the material inputs required by machines, mechanisms, and equipment, and also a significant increase in their service life. These goals can be reached by the direct application of plasma technology, heat-resistant metal, powder coatings to improve thermal wear and corrosion resistance, and the expanded use of plastics and composite materials.

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\*V. I. Lenin, Poln. soch. soch. [Complete Works], Vol. 36, p. 116.

The machine-building sector owes it to the economy to create means for the mechanization and automation of handling, transporting, and warehousing operations. The 11th Five-Year Plan should witness a transition to the design, production, and utilization of machine systems and packages, and also automatic lines for over-all mechanization of every stage of the production process - from mining the raw materials to the manufacture of the final product.

It is also necessary to continue work on designs providing series and, when necessary, mass production of machines, equipment, and instruments for theoretically new, technological processes guaranteeing a good technical and economic result. One of the most important goals of the over-all scientific and technical programs for the development of machine building is the construction and utilization of the production from sectors with over-all mechanization and centralized control.

One indicator of the economic efficiency of production is the improvement in the use of material resources - both raw materials and fuel. We take, for example, the case of metal. Enormous sums are expended on its production. In 1979, the country produced 149 billion tons of steel, 103 billion tons of rolled steel, and 18.2 billion tons of steel tubing. Nevertheless, metal shortages continue to hinder our economic development.

It should be noted that a large part of our efforts in working out plans is directed at searching for reserves to improve metal productivity and to buildup new capacity. It would hardly be right to focus the attention of the planning and economic facilities only on this side of the problem.

The main point today, obviously, is that a qualitative reorganization of the operations of the metallurgical industry is required, along with economical practices by the consumers of metal products. Reserves are important in this area. There is a significant possibility of reducing metal consumption in ferrous metal industry itself, for example, by a more rapid expansion of continuous steel teeming, treatment of liquid steel with synthetic slag and inert gases, and the implementation of other measures.

Wide-spread substitution of polymer materials for ferrous metals in industry also gives promise of substantial savings. It is estimated that with the total utilization of available possibilities the country's consumption of ferrous metals could be satisfied by a relatively slow growth rate for steel and rolled steel production. Therefore, a systematic and

single-minded determination is needed to improve the productivity and utilization of metal production. Our efforts should be concentrated in this direction.

We will consider another, no less important problem - fuel. We have built a powerful fuel and energy complex in this country. However, the requirements of the country for fuel and energy resources are growing rapidly. In this regard, the shift of the fuel extraction industry to the east and north should be kept in mind, since the extraction and transportation of fuel are increasing in cost.

Therefore, along with increasing the capacity of the fuel and energy complex and improving its structure, energy conservation by all industrial units and communal organization is of the highest importance throughout the government. Calculations indicate that expenditures for a more rational and economic utilization of fuel and energy in many areas are a factor of 2-3 lower than capital investments needed for their extraction, and a 1% reduction in the consumption of electrical energy and fuel in the national economy yields savings of approximately 17-18 billion tons of conventional fuel.

The need to raise the level of control and planning was pointed out at the November plenum. It then follows that the plan for developing and introducing new technology should be organically related to the plan for production and capital construction. This approach means that both the production plan and the capital construction plan should be based on the plan for scientific and technical progress and should be its extension and materialization in production and fixed capital.

The way the ninth Five-Year Plan was fulfilled and the planning of basic projects for economic and social development for 1990 and the eleventh Five-Year Plan have shown that the continued growth of the economy and the welfare of the people can no longer be ensured only on the basis of specialized trends and factors involving extensive development. The only correct and reliable policy is to put the entire economy resolutely on the track of intensive development with improvements in efficiency and quality. There are no alternatives to this policy, and it should be carried out unflinchingly during the eleventh Five-Year Plan.

We must make sure that in our plans and practices we provide for an accelerated introduction of scientific and technical advances in industry, the creation of realistic organizational, material, and technical prerequisites for an increase in the growth rate of labor productivity, and savings in raw materials, semi-finished goods, and fuel-energy resources in all segments of the economy. This is why, on July 12, 1979, a resolution of the CC CPSU and the USSR Council of Ministers paid special attention to improving the plans for the development of science and technology along with the use of planning to strengthen the role of science in raising productivity. This resolution aimed planning and economic activity at the achievement of high-level economic end results and a fuller satisfaction of growing social needs.

However, something else must be kept in mind. The best plans can remain on paper, the best machines may not work, and the richest resources may be depleted futilely if the people who carry out the plans, run the machines, and exploit the resources are not efficient, purposeful, responsible and persistent. All branches of the economy can be developed successfully by the everyday care on the part of each worker and each collective for continued improvement in labor productivity, the efficiency and quality of work, organization and discipline, and for greater savings and economy.

The party turns to the workers in cities and villages with a call to make 1980 a year of intensified work and work in the spirit of Lenin. The necessary conditions have been laid down. The peaceful work of the Soviet people is reliably protected, no matter what changes occur on the international scene. Our motherland has a mighty industry and sufficient supplies of natural resources to ensure the further all-round development of the economy.

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COORDINATION OF HUMAN, TECHNOLOGICAL FACTORS STRESSED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 3, Mar 80 pp 15-33

[Article by T. I. Zaslavskaya, corresponding member of the USSR Academy of Sciences, Institute of Economics and Organization of Industrial Production, USSR Academy of Sciences Novosibirsk Branch, Novosibirsk: "Economic Conduct and Economic Development"]

[Text] The director of one West Siberian millionaire sovkhoz, a person wise in the ways of the state, a captain of rural industry, told me about the work mechanism of unregulated links. This form of labor organization is certainly progressive and provides a sharp increase in labor productivity thanks to a more responsible and smarter approach by the people to their work. As a result the average monthly salary of a machine operator in such a link based on the yearly results exceeded 500-600 rubles--the payment for labor.

Then, a couple of years after its formation, the link broke up.... In the director's opinion, the reason was that the people had "stuffed their pockets," and had accumulated enough money to acquire vehicles and, "due to the lack of other requirements," are returning to less intense, less responsible labor paying 200-250 rubles per month. They see no requirement to put forth maximum effort.

How this situation differs from that in rural areas during the postwar years! The leading category of workers in the sector--agricultural machine operators--now have no special need for kopeks, let alone rubles.

This fact is certainly not a local phenomenon. It is fully known to economists and materially influences the work of enterprises. The interests of production often require urgent, special, unplanned work not falling within the direct responsibilities of enterprise personnel. It would seem that their pay was sufficiently high and applicants would be easy to find. However, many workers have no serious interest in extra funds and the levers of material stimulation often are useless.

Does this signify that a full satisfaction of demand has been achieved and further growth in production is unnecessary? Undoubtedly it does not. Although the contemporary standard of living of the Soviet people is incomparably higher than before, there can be no talk about any kind of "saturation" of the demands of the basic mass of the population. Then what is happening?

The reasons that the rapid rise in production and further improvement in the workers' level of consumption are encountering obstacles in the form of supposedly insufficiently developed demands of the population are rooted, of course, not in the low level of culture of the Soviet people and their lack of development as consumers. The problem is the scarcity of the supply of goods or services which would be capable of creating a sufficiently broad spectrum of powerful "temptations" for buyers. Personal accumulations by the population in savings banks have exceeded one-half of the sum of the annual trade turnover of state and cooperative trade. This signifies that even the apparent portion of the monetary accumulations could permit people to preserve the usual level of consumption without going to work for 6 months. The logic, of course, is exaggerated, but it gives a picture of how the thrusts of the planned control of economic development "are sagging" due to the unequal market situation.

It is not accidental that in recent years a path has been laid towards tendencies holding back solution of economic and social problems. This primarily is a decrease in the rate of growth of the national income, reduction in the capital-output ratio indicators, nonfulfillment of plans for a growth in labor productivity, a shortage in the trade of several important food and broad consumption items, and others. The "production-supply-consumption" system, as is apparent, is in a closed loop. To break open this loop and convert it into an ascending spiral is not a simple matter, but it is extremely necessary. It will hardly be possible to ensure high rates of economic development en route to intensification of the economy without solution of this problem.

The task of coordinating the interests of man and society does not, naturally, leave Soviet sociologists who are working at the juncture of economic and social problematics involving communist construction indifferent. The CC CPSU and USSR Council of Ministers decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" demands that scientists place even steadier attention on the social and human factor of economic development.

### Man and His Affairs

Contemporary production more sharply than before senses the significance and complexity of the human factor. As never before it is experiencing the dependency on qualities of the worker who, on the one hand, is capable of highly effectively using the colossal production apparatus created for him but, on the other hand, due to carelessness or low qualification, is capable of causing serious harm to the economy.

Man-machine technological systems in the scientific-technical revolution create ever higher demands for worker education, qualification, and reliability.

In our time the ideal worker, let's say, for a large animal husbandry complex is the graduate not of just a vocational-technical school, but of a zootechnical tekhnikum. And, this is understandable. The results of the work of many people depend on the knowledge of this worker and on his skill in maintaining the herd with the aid of the machine and equipment system.

The results of the labor of not only the individual worker, but also the activities of many associated collectives depend on going or not going to work, on the correct or incorrect decision. However, an individual's reliability and responsibility are phenomena on a plane different than the reliability of machinery. Much depends on the realization by the worker of his own participation in the overall matter, on the degree of his subjective "inclusion" in the production process, his identification with the collective, and with the content of the labor. From here stems the requirement for stable cadres: workers, specialists, and especially enterprise supervisors.

The country's economy is based on a stable backbone of specialists, supervisors, and production organizers. This is the "yeast," "leaven" on which the economy rises. If the leadership is qualified, stable, and has initiative, enterprises develop in accordance with long-range goals, economic practice does not experience unexpected zig-zags, it does not gravitate to minute-by-minute interests. Where supervisors and specialists are not included in the life of the enterprises and do not tie their own fate with the fate of the collective, there is no need to even discuss long-range programs for production improvement. The outcome is low and slowly-developing results of production activities, workers who lack the perspective for improving labor conditions and pay, an indifferent attitude towards work, and a high turnover of cadres. The circle once again closes.

I emphasize that the essence here is not only that the modern worker possesses complex and expensive machine and equipment systems and determines through his attitude towards labor effectiveness of their use and self preservation. The objective tendency of NTR [scientific and technical revolution] is gradual liberation of the individual from direct maintenance of production processes, from routine, dull operations. The worker more and more concentrates on execution of purely human functions: making important decisions, seeking better variations of technologies, and development of new ideas. In this connection he himself chooses: distribution of universal secondary and improvement in professional education, intensification of all forms of intercourse, and a rise in multifaceted information available to individuals form a personality confident of its power and with an intense requirement for self-expression and self-affirmation.

Such a personality is capable of doing a great deal but it is not able, nor does it desire, to serve as an executive mechanism, albeit even the most complex. Therefore it is vitally important that there be a balance between the creative capabilities of modern workers and those possibilities which production presents to them. Disruption of this balance to one or another side in the complex and diverse process of development of social productive forces is replete with serious consequences.

A key role in the economic "nature-equipment-man" system falls to man. And if in any sector the human factor turns out to be less reliable than the equipment,

the system is forced to turn to its reserves and redundant links to compensate for unavoidable losses. According to an evaluation by specialists at the Slavgorod plant in the Altay where they repair K-700 tractors, in 80-85 percent of the instances the reason for vehicle breakdown lies not in defects of construction and manufacture, but in the unskillful operation by machine operators and mechanics. And, one such giant costs 18,000 rubles; its productivity in difficult agricultural operations exceeds by several times that of the older DT-54. The statistics of production trauma also are an alarming signal of the disparity between labor culture and the strict requirements of industrial production.

### The Fulcrum--Social Growth Factors

The history of the development of productive forces has known two powerful "drives" forcing the worker to adapt to production's changing requirements: unemployment and hunger. Socialist society has freed man from these severe restraints. However, the problem of coordinating the human and technical factors of production objectively exist. Moreover, this problem intensifies with development of technology and with a growth in self-awareness and the demands of the environment and of one's self. The motivation and the specific types of conduct of man in social production, in the labor process, in the frameworks of distributive ratios, and then in the sphere of sales, income, and consumption, as it appears, now form their own kind of "solar plexus," the center of the socioeconomic problems of our society. In essence, this is a problem of ways of vitalizing the man-worker and mobilizing the social factors of the growth of labor effectiveness; therefore scientists concentrate their attention on it.

The system of socioeconomic relations works successfully only where one finds all its links interacting in coordination. Sociological science observes several points, the interaction upon which can insure development of the system in the direction needed by society. Three types of social factors which materially influence from various aspects production efficiency have been designated in particular: the number, quality, and territorial disposition of cadres; the complex of worker living conditions; and the system of socioeconomic relations in social production.

It is clear that contemporary technological systems can function effectively only if production has been supplied cadres of the requisite number and qualification, that is distribution of workers by sectors and regions in accordance with where the jobs are. However, this condition is often ignored, serving as one reason for insufficient effectiveness in scientific-technical progress. Failure to supply cadres for valuable jobs, breakdowns in the education and professional training of workers operating complex equipment, irrational streams of population migration, and high labor turnover are phenomena which attract social attention, are being studied by scientists, and are being monitored by planning and directive organizations.

A second group of factors is the level, type, and quality of life of the population. If the number, quality, and disposition of cadres affects the results of production directly, then living conditions play the role of a feedback mechanism--from production results to cadres. The more efficient the production, the purer the product created, then the greater the workers' consumption fund and the faster the growth of non-productive capital and

of the social infrastructure. Correspondingly, the lower the migration of cadres, the higher the number and quality of the work force, the more favorable are the dynamics of production efficiency.

That is one possible variation of the effects of the interrelationships mentioned. There is also the opposite variation when insufficient production efficiency means low incomes and slower development of the social infrastructure. From this comes the migratory flow of workers, a reduction in the number and the quality of the cadres, a reduced growth of production efficiency. Unfortunately, this variation is often encountered. A change in the population's living conditions is a unique control lever for the movement of cadres. Is it sufficient to regulate production efficiency? From our point of view, this question must be answered in the negative.

The fact is a change in the extent irrational trends of labor mobility and redistribution of cadres among regions, sectors, and professions requires a fundamental transformation of the living conditions of the corresponding group of workers. It is sufficient to mention the necessity to overcome the social differences between urban and rural life or creation of the superior living conditions of the people in the eastern regions. Since a deterioration in the living conditions of even individual groups of population contradicts the principles of socialism, an improvement in the living conditions of those groups of workers who find themselves in a disadvantageous position can only be achieved through the necessary redistribution of benefits, that is at the cost of large additional expenditures. Where does one find the necessary resources? When production is developing effectively society has sufficient reserves to transform distributive ratios. When there are periods of decline in production efficiency accomplishment of similar programs encounter great economic difficulties. That is why improvement in distribution serves as an important but far from decisive means of improving production efficiency.

Under these conditions special attention falls to a third group of social factors for improving production efficiency involving methods for controlling the production activities of people, their "inclusion" in economic development processes, and the coordination of workers' personal interests with the interests of labor collectives and society.

### A Complex of Problems

Sociologists refer to the direct and indirect regulation of human conduct. Regulation of traffic is an example that illustrates this difference. Thousands of vehicles move to their destinations via a complex network of streets, boulevards, and crossings. Now then, located at a control center, does one ensure rapid and safe arrival of all vehicles at their destination without allowing "stoppages," accidents, and catastrophes, or deviation of the transportation flows from the main streets to impassable routes? This apparently can be done in a variety of ways.

The first requires concentrating in the control center information on the movement of every vehicle, systematically building up this information, analyzing it, setting up the optimal trajectory for each sequential section of the route (considering the overall traffic flow), and informing the drivers, via radio perhaps, which speed to maintain, where to turn, to whom to give the right-of-way,

who to pass, and so on. This method probably is practical given the slow movement of a few vehicles. However, due to the increase in the flows of traffic the control functions in this approach would become impractical.

Another control method involves development of general traffic rules which every driver must adhere to. The control center, free of the excess work, can concentrate on monitoring adherence to the rules, analyzing their effectiveness, and improving them further. The position of the drivers also changes: if in the first instance they were mainly responding to an outside force, in the second case they independently evaluate the road situation and the route within frameworks permissible under the traffic rules and they then select the best routes to take. Their labor becomes more creative and they mobilize professional knowledge, skill, and volitional qualities. What is the overall result of the system's operation? From which instance can one expect greater speed, safety, and rapid achievement of goals? Apparently in the latter instance, when optimum solutions are sought not only by the "control center" itself, but by thousands of minds well informed about the features of the specific, rapidly-changing situation.

The economic system combines two ways of controlling the activities of workers and collectives. This, on the one hand, is centralized planning and administrative control of production while, on the second hand, it is indirect regulation of the production activities through introduction of rules presupposing the conditions of economic and social interaction of workers, labor collectives, and the state. Planning assignments with which executors are tasked for output of products, mastery of new articles, conservation of materials, and the like are mandatory and require unconditional execution. The sphere of independent selection of the best solutions is limited here since the workers and collectives are primarily functioning as executors.

The economic mechanism plays a different role in regulating production activities. Prices of certain types of products, tax rates, the level of physical inputs, norms of material expenditures and profit withholding taxes, and wage tariff rates serve as the "red and green lights" pointing out which types of economic conduct are being stimulated and approved by the state, which are permissible, and which are forbidden and punishable. Each production collective must solve two interrelated problems: fulfill the mandatory plan and achieve the best economic results using the complete selection of capabilities made possible by the economic mechanism.

The principled significance of centralized planning in the development of a socialist economy is understandable. Its role is analogous to determination of the destinations of the traffic, compilation of routes given to the drivers at the moment they depart. In addition I would like to emphasize the large role of correct economic "signals." It is not difficult to imagine what would happen if the traffic cop mixed up the traffic lights. Broad thoroughfares would be empty while alleys and dead ends leading "nowhere" would be filled with vehicles.... It comes to mind that something quite similar can happen in economics. Do the elements of the economic mechanism always stimulate the requisite means of labor conduct by the people that is advantageous to society?

Not always, unfortunately. Numerous examples of discrepancies in local and economic interests find their way into the press almost daily. Take just the rate of profitability found in product prices. It would seem that the scarcer the product, the more society needs it, the more advantageous it would be to produce it. The scarcest agricultural products today are meat and milk, but for the majority of enterprises their production is less profitable and, for a significant number of enterprises, it is simply unprofitable. Additional production of these products, on the one hand, is tasked to enterprises by means of centralized planning and, on the other hand, is not economically approved since, with an increase in delivery of meat and milk, enterprise profit decreases and losses increase.

Difficulties with production specialization could serve as another example of a discrepancy in economic signaling from the real interests of society. The economy is interested in the development of a division of labor which opens a way towards improved technologies and an increase in product quality. Ministries, departments, and associations are taking specific measures towards enterprise specialization, but on the whole it is proceeding slowly as if it were running into some sort of opposition. Could the reason be the sluggishness of the supervision at enterprises where the advantages of specialization are not understood? Certainly not. The fact is, in particular, that due to differences in profitability in production of the products more specialization is reminiscent of the fairy tale about the wise peasant and the simple bear who divided a ripe turnip and a cabbage between themselves. Some enterprises are tasked with profitable types of production and the economic results of their activities increase regardless of the actual quality of the work. Those enterprises which are left with the "leaves" of the turnip, disadvantageous production, turn out to be the innocent ones who get the blame. It is understandable that such a system of economic relations does little to facilitate the development of a division of labor. More timely is an examination of the system of wholesale prices noted at the beginning of the Eleventh Five-Year Plan and tasked with creating conditions for equalizing profitability by sectors of production specialization.

Who is it that is unfamiliar, let's say, with the fact that production of a high-quality product is often disadvantageous to enterprises and output of low-quality articles ensures good economic indicators. Complex creative labor is often worth less than simple labor, while administrative work is worth less than productive work. Then there is the circumstance that it is more difficult for enterprises to shake off unnecessary workers than it is to keep paying them when, in essence, they get nothing in return! It would seem that these incongruous facts show that the system of economic "signaling" does not ensure the required coordination of the interests of the individual, the collective, and society and, in a number of cases, stimulates conduct contradictory to social interests.

One must call upon methods of administrative control for assistance in balancing the situation and insuring the development of economics: /To establish/plans for the output of each individual type of product in real indicators, fund its distribution, divide the functions between enterprises in a orderly manner, and so on. Substituting administrative regulation for the economic mechanism within specific boundaries is possible as it is possible,

let's say, to raise water using a pump system. But, this is complex, expensive, and not especially effective. It is much more natural and simpler to have the water flow due to gravity and irrigate fields along the way, pumping it only in those areas where there is no other choice.

Due to lack of improvement in economic "signaling" the channels of administrative control overload the economy. Moscow must then take upon itself solution of too wide a range of problems and often with insufficient data. /From this/ (items in slant bars printed in boldface) come the unavoidable breakdowns, underestimation of local features, various imbalances, and, in the final analysis, incomplete utilization of reserves and delay in development of the economy.

That is why we greet with such satisfaction the complex of measures to improve the system of economic levers and stimulants noted in the July (1979) party and government decree.

#### What Kind of Worker are We Preparing?

Each of us entering the sphere of social production for the first time encounters an extant system of economic relations. In his labor activities the worker must, on the one hand, subordinate himself to the rules and fulfill planned tasks and, on the other hand, take into account the signals of the economic mechanism, seeking in the "economic labyrinth" methods of action leading to the best results. Being included within the system of economic relations and subordinating himself to its actions, the worker gradually acquires new personality traits, masters specific types of conduct, and is formed into a specific social type. And a mass type of worker possessing a specific attitude towards labor, motivation and norms of conduct in production in turn becomes an important condition for economic functioning and development.

The socialist principle of distribution by labor directed towards universal vitalization of each individual for the good of society was rigidly formed in the first years of Soviet power: "He who does not work does not eat." This concept today is less rigid: "He who gives more to society will receive more." But, does the individual who actually makes a great contribution always receive more? Unfortunately not always. Deficiencies in the rigid administrative control of wages which do not take into account local features of production impel many supervisors to independently seek a way out of the situation rightfully and wrongfully ensuring an acceptable level of payment for the labor of the necessary workers. Some of the methods that one encounters here! They transfer workers who are due an increase in wages to a new job without changing the responsibilities; they increase the wage using the bonus; sometimes the labor norms are lowered so that people are able to receive a double and sometimes a triple rate and so on. As a result some workers had the opinion that the situation concerning wages means, if you can't violate the system, you can easily obviate it. In addition the universal conviction that the salary in all cases is actually earned is disrupted. Some workers have the orientation of doing less and getting more; as they say, "fish in trouble waters." And, some individuals do succeed.

Naturally, what has been said does not apply to all workers. But can be example of the economic flowering of a specific shirkers and loafers not

influence the views and conduct of people who observe this? This primarily relates to youths whose personality has not yet taken firm form, whose convictions are only in the formative stages. One cannot allow the demands, interests, and situations of workers whose views are founded under the conditions of incorrect socioeconomic "signaling" to diverge from the general situations of society--this is the concept behind the party and government decisions in the field of improving the systems of labor and wages.

We recall the disaster with organization of the uncommitted links. A person possessing a high qualification and capable of working in an excellent manner does not want to work at full bore, preferring the "soft life" to this. The system of economic stimulation was unable to spur on the creative potentials of a worker and left him indifferent to the tasks of the economy and demands of society.

We note, by the way, based on data from sociological investigations wages occupy far from first place in the motives for turnover and migration, in the reasons for dissatisfaction of workers for their job, and in motivation for the different forms of labor conduct. They make the hasty conclusion that workers labor not so much for the resources upon which to exist, but because labor has become their first vital need.

Is it correct to compare these motives? Workers in socialist production, just like all people, are material beings, their vital needs have a material character. The system of Socialist production relations is such that labor in social production has become the main source of peoples' existence. It is natural that under normal conditions people are materially interested in labor, they value work which provides a decent wage, changing to new work, not indifferent to the fact that it will provide materially. Otherwise it would be necessary to sound the alarm. For this would signify that the basic system of material stimulants is working poorly and people are receiving a noticeable portion of their resources for existence not through labor and social production, but from some sort of secondary sources.

Let's take another example. A young supervisor, striving to accelerate the rise in production, took an economic risk. It is still unknown what the experiment will bring, but a storm bursts over the head of the enthusiast. He receives a reprimand, he is "referred to and mentioned" as a negative example. Time brings good results and the experimenter's experience will be disseminated to other enterprises. One would think that it is the time to take pride and accept the new changes. But no, the individual has changed. Instead of an enthusiast, we have an individual "wise from experience" and a quite careful worker. He does not intend to make any more mistakes, thinking he has "done enough. let others experiment." He is balanced, efficient, does not make plans, it is easier to control his conduct. But, did society win in this regard? Do we need this type of supervisor?

There is one more channel where socioeconomic relations influence the formation of a worker type--the failure to reprimand low-quality work, careless attitudes towards equipment, absences from work, tardiness, and other violations of labor discipline. There are insufficient workers in many regions of the country and sectors of the national economy. Vacant jobs, low shift coefficients,

and choke points in integral production lines force enterprises to not look deeply into workers' references and to keep them on at all costs, the front office reproaches the poor worker, brigade meetings and social organizations "look into things." But, things usually don't come down to actual punishment (first through the pocket book, then through firing). Meanwhile the poor worker quite rapidly becomes accustomed to admonitions. Failure to punish shirkers and shoddy workers not only confirms them in their selective line of conduct, but also exerts an influence on the conscientious workers who feel themselves unjustifiably restricted and placed on the same level with the loafers.

### Economic "Independence" and Its Results

The circumstance that the system of economic relations forms the worker reflects only one aspect of the question that interests us. Another is that people with their needs, interests, goals, and means for their achievement exert great feedback on development of the economic relations themselves. A person is far from being a bolt which one places in a piece of equipment and is left there to operate. He does not simply adapt himself to the system of economic relations, but actively studies it, and if necessary finds the weak points within it; where possible he tries to put them to use. A clear example are the violations of the norms of economic conduct noted also in the party decisions on improving the economic mechanism and in the numerous speeches printed in the central press. I refer to this entire total of violations of planning, financing, and other norms for brevity as the "shadow economy" and will use this purely conditional term from now on.

The insufficient reliability of centrally-allocated supplies and at times lack of funds for planned tasks forces economic supervisors to seek unregulated, at times illegal, ways of obtaining the necessary resources, ways to attract workers, and so on. This often refers, for example, to construction which is led by the so-called economic method, where enterprises build new or reconstruct extant installations of a production and non-production nature in accordance with the state plan, but on their own.

Approximately 80 percent of the construction and installation work in agriculture in Western Siberia is accomplished using the economic method for which no centralized resources are set aside in the plan. This means that four-fifths of the materials and equipment that are required for construction come from outside of the plan. Where do they come from? Fuel for the vehicles comes from Kazakhstan, metal from Novosibirsk, coal from Kemerovskaya Oblast, cement from... Apparently a commercial secret exists here. One must respond with meat, copper, and products from animal husbandry--benefits, documents that do not consider everything involved. One can presuppose that a noticeable portion of the turnover from agricultural enterprises follows these channels. And this does not only involve agricultural enterprises: the relationship "you scratch my back, I'll scratch yours" is developing among industrial, construction, and transportation organizations, encompassing all new spheres of influence.

Development of the "shadow" economy leads to certain socialist enterprises including in the "real exchange" not only real production, but also acquired

production resources. Allocated from this number are resources beginning to aspire to the role of "general equivalent"--cattle, cement, brick, and pipes.

It is clear that the "shadow" economy forms a reaction by production to deficiencies in the basic and planned economy, that both systems of economic relationships are interrelated as closely as a real item is with its shadow. One cannot ignore the "shadow" economy; the results of its covert functioning reduce the vitality of planned production regulation, distribution, and consumption. There occurs a covert redistribution of incomes between social groups, sometimes inflicting noticeable harm to overall state interests.

Curbs using all measures acceptable to society--economic, legal, social--might serve as similar phenomena. However, the matter is more complicated. First, society does not have the capability of fully curbing all undesirable forms of economic "independence" if only because it is not sufficiently informed about its content. Second, and more important, the "shadow" economy took root in the system of basic economic relations and merged closely with it. Therefore attention should be concentrated not only on the battle against individual manifestations of the "shadow" economy, although this is necessary, as much as on improving the basic system of economic relations--methods of centralized planning and the economic mechanism. The CC CPSU and USSR Council of Ministers decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" passed in July 1979 is devoted to these key questions. The decree's central theme is the necessity to materially improve the system of economic signals and stimulants, restrict the number of administratively-established planning indicators, and increasing the attention of the social aspects of production development and on mobilization of social reserves.

#### Sociology's New Tasks

Contemporary conditions of societal development place new tests before sociology. The idea is that sociology must decisively turn towards economics and fully investigate the fundamental laws of peoples' production conduct, in particular its dependence upon the system of society's economic and social relations, and ways to "tune" the economic mechanism. On the one hand, the very close "congruence" of sociological research with economic research has matured while on the other hand, there has been a restriction in the spheres of their influence. Economic science studies economic relations mainly from a "non-subjective" point of view. Social production and the commodity and capital markets are examined here as arenas of interaction for the multitude of economic subjects, each of which in isolation not attracting the attention of researchers.

In the sociologists' center of attention are groups of people occupying a specific economic and social position, possessing a specific structure of needs and value orientations, and distinguished by a nature of conduct. These people are not only workers occupied in social production, but simultaneously also family members, owners of private property, employees, patients, customers, and so on. Sociologists are interested in why certain groups of workers "enter" production and why others "leave" production. It is important for them to profoundly understand the methods and motives for peoples' economic conduct and thereby learn to forecast their reaction to modernization of economic relations.

Unfortunately at present our sociology has not established sufficiently close and comprehensive contacts with economic science. Perhaps this is why the descriptive approach often overshadows the administrative approach in sociological research. Giving a broad comprehensive picture of what happens in the sphere studied (for example, the qualitative make up or the mobility of cadres), sociologists do not study in sufficient depth the influence of these factors on the effectiveness of production and on the probable dimensions of expenditures and the effect when accomplishing intended measures. At present sociologists more often "require" resources for solution of social problems than point out sources for the growth of production production efficiency due to social factors and vitalization of the man-worker.

Participation by sociologists in development of effective means for tuning the economic mechanism is especially important. It is not enough to say that this mechanism at present does not meet the requirements of production development. It is important to explain what form it should take and what social consequences certain changes in its structure will lead to. One cannot in fact test in practice one after another of all conceivable variations for combining centralized and decentralized methods of controlling the economy, material and moral stimulants, and systems of planned and accounting indicators! Study of socioeconomic processes makes it possible to develop theoretical proposals on possible variants of economic relations, progressive trends in their development, and the probable results of society's movement in a particular direction.

The July (1979) CC CPSU and USSR Council of Ministers decree legislates a situation whereby the collective work of scientists directed towards a search for the most effective ways for further developing society must precede the formulation of the state plan for economic and social development. Formation of a system of alternative forecasts which reflect the probable results of various ways of controlling society becomes an important part of this effort. The combination of such forecasts characterizes the expanse of possible future states of society. Accomplishment of this work is inconceivable without close cooperation between economists and sociologists. The latter here must evaluate social reserves which can be put into action through retuning the economic mechanism and improving the planning system.

The CC CPSU and the USSR Council of Ministers decree also tasks sociologists to search for optimal means for retuning economic relations and the transformation from the extant system to a new one. It is a case where the system of economic relations has an important social component: it stipulates the special features of the social structure of society, the arrangement of classes and social strata, and the content of their relations. Let's just look at one detail, the level of centralization of economic control, that is the distribution of competence for making economic decisions among primary labor collectives, enterprises, associations, and ministries. A specific degree of centralization of control means the corresponding distribution of rights and responsibilities among various groups of people, it specifies and refines their actual relationship to the resources of production that are found in state or cooperative property, and this means their place in the social organization of production and social position.

In light of this any, and moreover a serious, reconstruction of the economic mechanism affects the interests not only of enterprises and departments, but also of social strata and groups. The social economy, the country's entire economy, wins when there is reconstruction of the system of economic levers and stimulants. The population as a whole also wins since production begins to develop more rapidly, and this means also that the standard of living of the people will grow at high rates. However, certain social groups can lose since it is difficult to predict the entire spectrum of consequences of a particular variation for improving the economic mechanism. It is understandable that those social groups whose interests in the main coincide with the trend in the intended changes will become a reliable bulwark of the party and the state in reconstruction of extant economic relations; those whose interests are threatened can more or less actively oppose the new innovations. It is important to have a clear understanding of the structure of social interests and to correspondingly regulate the conduct of different groups in order to successfully realize the intended transformations. Accomplishment of the tasks assigned by the party will facilitate this.

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## PLANNING AND PLAN IMPLEMENTATION

### COORDINATION OF CURRENT, LONG-RANGE PLANNING REVIEWED

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[Article by A. Balashova, candidate of economic sciences, chief of a subdivision of the USSR State Planning Committee, and A. Zalkind, doctor of economic sciences: "Combination of Current and Long-Range Planning"]

[Text] As is well known, the system of national economic plans formed in our country includes long-range, five-year and annual plans. Such a system reflects the objective patterns in expanded socialist reproduction. The five-year plan with an annual breakdown plays a key role in this unified system of plans for economic and social development.

In principle, the problem of a correct combination of long-range and current planning was raised and solved by V. I. Lenin after the example of the GOELRO [State Commission for the Electrification of Russia] plan. Evaluating it exceptionally highly, at the same time, he drew special attention to its coordination with current planning. V. I. Lenin stressed the following: "It is necessary to especially connect the scientific plan for electrification with current practical plans and their actual implementation. This, of course, is absolutely indisputable."<sup>1</sup>

In one of his letters to G. M. Krzhizhanovskiy V. I. Lenin recommended that one or two subcommissions of the State Planning Committee engage in the plan for electrification and eight or nine subcommissions, in current economic plans.<sup>2</sup> Lenin's principles served as the basis for the organization of planning.

The decree dated 4 October 1965 of the CPSU Central Committee and the USSR Council of Ministers points out the following: "... The five-year plan (with an annual distribution of the most important assignments) is the basic form of state planning of national economic development."<sup>3</sup> Such a role of the five-year plan is due to its fundamental characteristics. As compared to the long-range plan it is a much more detailed and address plan. The limits of the five-year plan make it possible to calculate it with comparative accuracy and under the present conditions of use of mathematical methods in economics and of computers, to develop a large number

of variants. Much bigger national economic problems are solved in the five-year plan than in the current plan both in the area of production and construction and in sectorial and territorial terms.

The five-year plan makes it possible to concentrate the efforts of planning and economic bodies on the solution of the basic technical, economic and social problems raised by the party at a given stage in the country's development, to fulfill a significant social program, in particular to carry out housing construction on a large scale, to realize the appropriate part of long-range overall programs, to commission powerful economic projects and to solve other problems.

Being the basic form of planning, the five-year plan determines the decisive tasks of annual plans and the rates and proportions of the development of the entire national economy, sectors and rayons in a given year. Annual plans have their foundation in the five-year plan. However, the feedback of current and five-year plans is also of exceptional importance for planning. The latter can be realized only through annual plans.

Five-year and current plans are of the same nature. Their unity is manifested primarily in methodology. Both types of plans proceed from the Leninist principles and methods of planning, are of a scientific and party nature and are directed toward the solution of the same economic and social problems.

Both five-year and current plans are developed on the basis of the balance method of planning with a combination of physical and value balances. Both types of plans ensure the unity of the sectorial and territorial aspects of planning and both plans, on the whole, have a common structure and approximately the same system of indicators.

Both five-year and current planning is directed toward the accomplishment of the main task--rise in the workers' standard of living. However, this does not rule out some of their differences connected mainly with the detailing of planned assignments. The latter are consolidated in the five-year plan and are more specific in the annual plan.

The unity of five-year and current plans is manifested in an annual breakdown of the five-year plan. Each annual segment represents its organic part.

Annual plans, having the five-year plan as their base, make it possible to use better forms, methods and means of realization of all the tasks of the five-year plan. They envisage the utilization of potentials and capabilities, which cannot always be taken into consideration accurately at the stage of development of the five-year plan. The basic problem always solved by the USSR State Planning Committee is to ensure by means of annual plans an unconditional realization of the main task of five-year plans and the attainment and surpassing of all the drafts of the five-year plan for the development of sectors and regions.

In order that the assignments of annual plans may be higher than similar drafts of the five-year plan, the USSR State Planning Committee takes into account the realistic conditions under which each annual plan is developed. At the same time, however, it never developed national economic plans "according to the attained level." Plans would have been built "according to the attained level" if the USSR State Planning Committee had proceeded from the method of extrapolation and mechanically added the growth percentage to the attained level. However, such planning never existed in our country.

Ensuring the unity of five-year and current plans is a complex task. Let us examine its accomplishment by the USSR State Planning Committee, using as an example the solution of a number of major national economic problems of prewar and postwar five-year plans. Of the prewar five-year plans let us take the first and second and of the postwar five-year plans, the ninth and tenth. Of the range of problems of the First-Five Year Plan let us dwell on its pivotal idea--Lenin's plan for the country's industrialization.

Approving the First Five-Year Plan, the 16th party conference stressed that it signifies primarily the "maximum development of the production of means of production as the basis for the country's industrialization..."<sup>4</sup> The plan envisaged sharply outstripping rates of growth of industrial sectors of group "A." According to the optimum variant of the five-year plan the output of these sectors should have increased more than three-fold during the five-year period and of the sectors of group "B," by a factor of 2.03.<sup>5</sup>

The First Five-Year Plan had four annual plans: for 1928/29, 1929/30, 1931 and 1932. In addition to this, a plan was developed for a special quarter of 1930 in connection with the postponement of the beginning of the economic year from 1 October to 1 January. The first two annual plans were developed before the confirmation of the five-year plan in the form of control figures. At that time, however, the USSR State Planning Committee was already armed with the directives of the 15th party congress and actively prepared the draft of the First Five-Year Plan. Therefore, its basic ideas were reflected in control figures, from which the USSR State Planning Committee made the transition to the annual national economic plan in 1931.

The five-year plan outlined rapid rates of development of machine building, chemistry, power engineering, the fuel industry and other key sectors of heavy industry. The nationwide socialist competition for the fulfillment of the five-year plan in 4 years uncovered potentials and made it possible to adopt in annual plans higher assignments than envisaged by the five-year plan.

Thus, assignments for the development of the fuel industry were greatly increased, as compared to five-year plans, in the plan for 1931. The refined calculations of the USSR State Planning Committee showed that, if the national economy developed at the rates envisaged by the five-year plan, there would be a lack of correspondence between the resources of fuel and the need for it. Therefore, in the plan for 1931 the USSR State Planning Committee greatly increased the rates of growth of the coal industry. Coal output for 1931 was envisaged in a volume of 83.5 million tons--almost 10 million tons more than the assignment adopted for the last year of the five-year plan.<sup>6</sup>

Significant amendments were introduced in the drafts for 1931 in machine building. The volume of output of general machine building was increased to 2.4 billion rubles, as compared to 2 billion rubles envisaged by the five-year plan for the last year. For the electrical engineering industry the corresponding indicators were 1 billion and 896 million rubles (in the prices of those years).<sup>7</sup> The task of exceeding the level of development of ferrous metallurgy established by the five-year plan for the last year was also set in the plan for 1931.<sup>8</sup>

For the purpose of accelerating the development of ferrous metallurgy the construction program of this sector envisaged by the five-year plan was changed considerably. Thus, instead of the construction of the small Levshinskiy and Tavda charcoal plants, the construction of a big plant in Nizhniy Tagil was begun; instead of the second stage of the Kerch' Plant, a big metallurgical plant, Azovstal', in Mariupol' (now Zhdanov) operating on Kerch' ore. In addition to this, the production capacities of planned plants were increased sharply. The data on two metallurgical giants presented below are characteristic.<sup>9</sup>

#### Cast Iron Smelting Capacities, thousand tons

	<u>Envisaged by the five-year plan</u>	<u>Actually established</u>
Magnitogorsk Combine	660	2800
Kuznetsk Combine	330	1200

Thus, planned capacities were increased fourfold. This major change in the five-year plan for ferrous metallurgy played an important part in providing the country with metal.

The final liquidation of exploiting classes and a full elimination of the causes giving rise to the exploitation of man by man were the basis for the political task of the Second Five-Year Plan adopted by the 17th party congress (February 1934). The main economic task of the Second Five-Year Plan--conclusion of the technical reconstruction of the national economy and establishment of the latest technical base of all sectors--was inseparably connected with it. This presupposed the formation of new ways

of establishing the material and technical base of socialism--all around electrification, overall mechanization of production processes and wide application of chemicalization. The accelerated development of machine building was the key link in the solution of the main economic task of the five-year plan. As during the First Five-Year Plan, during the Second Five-Year Plan special attention was given to ferrous metallurgy. The task of ensuring accelerated rates of growth of steel and rolled metal product production even as compared to machine building was set. An all-around development of the power base of the national economy was also envisaged. The construction program of the Second Five-Year Plan was directed toward these goals.

The annual plans of the Second Five-Year Plan were directed toward the fulfillment of its tasks. But, at the same time, like the current plans of the first and subsequent five-year plans, they raised specific problems meeting the needs of economic development during that period. The annual plans also took into account new party and government decisions.

For example, the plan for 1934 envisaged an especially rapid development of machine building, primarily transport and agricultural machine and motor vehicle building. It envisaged an accelerated growth of labor productivity in heavy industry sectors. Accordingly, the most stepped-up assignment for lowering production costs was set for heavy industry.

Working out the plan for 1935, the USSR State Planning Committee, noting the major advances in the fulfillment of the assignments of the five-year plan, at the same time, raised the problem of overcoming the lag in individual sectors. Therefore, the plan for a number of heavy industry sectors envisaged higher rates of growth than those envisaged by the five-year plan. Such sectors included the following: power engineering, the coal industry, ferrous metallurgy, steam engine and railroad car building, production of metalcutting lathes and locomobiles and so forth.

The plan for 1935 envisaged the mastering of 74 additional type sizes of metalcutting lathes. This meant that more than 215 type sizes should have been manufactured in 1935, whereas the five-year plan envisaged 200.<sup>10</sup>

A vast increase in production was envisaged in excavator building. Instead of 116 units manufactured in 1933 and 325 units, in 1934, the plan for 1935 envisaged the output of 735 units. At the same time, the plan was partially changed by the subsequent decisions of the USSR Council of People's Commissars. Improved types of excavators instead of less productive designs were put into production.<sup>11</sup>

The plan for 1936 was worked out in detail by the USSR State Planning Committee in territorial terms. Significant amendments were introduced into the plan for the development of individual regions. For example, the share of Moscow Oblast in the all-Union production of high-grade rolled metal products was to be increased to 10.7 percent, as compared to 10.1 percent according to the five-year plan.<sup>12</sup>

The plan for 1937 envisaged accelerated rates of growth of the production of a number of the most important means of production. Here are the pertinent data (in percent).<sup>13</sup>

	1936 in relation to 1935	1937 in relation to 1936
Coal	116	119
Crude petroleum with gas	109	118
Tin plate	127	198
Iron pipes	133	137
High-pressure steam boilers	150	216
Steam turbines	211	217
Steam engines	76	124

Summing up, it can be stated that, on the whole, the USSR State Planning Committee coped successfully with the coordination of five-year and current plans during the prewar period.

During the postwar period the forms and methods of ensuring the unity of five-year and current planning were further developed. The intensified use of mathematical methods in economics and an increase in the variance of planning on the basis of an expanded use of computers, especially in the State Computer Center of the USSR State Planning Committee, were of great importance. Let us examine this, using as an example the last five-year plans--the Ninth and the 10th Five-Year Plan.

The 24th CPSU Congress (March-April 1971) approved the directives for the five-year plan for the development of the national economy for 1971-1975. Five annual plans--for 1971, 1972, 1973, 1974 and 1975--were developed during the period of the Ninth Five-Year Plan. The first was approved in December 1970, that is, before the adoption of the directives of the 24th party congress, but it was an integral part of the Ninth Five-Year Plan developed at that time.<sup>14</sup> The other current plans were drawn up on the basis of the corresponding annual segments of the five-year plan. All the annual plans of the Ninth Five-Year Plan proceeded from the tasks set by the Communist Party in this long-range plan. We will show this, using agriculture as an example.

Proceeding from these tasks, the annual plans of the Ninth Five-Year Plan envisaged the specific quantitative parameters of the development of agricultural production. Principal attention was given to grain farming. On the basis of firm plans and above-plan purchases the volumes of state purchases of key agricultural products were determined for 1971. The importance of fulfillment of the assignments for above-plan purchases of agricultural raw materials was especially stressed in the plan. Attention was also drawn to this in subsequent annual plans.

In the plan for 1973 emphasis was placed on the intensification of irrigation in commodity grain production in arid regions--the Volga area, North Caucasus and South Ukraine. Provision was also made for an expansion of work on the establishment of long-range irrigated pastures and land reclamation in the nonchernozem zone, primarily in the RSFSR.

The volumes of state purchases of most agricultural products and raw materials were adopted in accordance with the assignment of the five-year plan for 1973. At the same time, an overfulfillment of its assignments for the purchases of vegetables, eggs and tea leaves was envisaged. In addition to this, the volumes of purchases of meat, milk, wool and grapes were slightly lowered as compared to the five-year plan.

In the plan for 1974 the assignments for the production and purchase of agricultural products, with the exception of individual items, were set mainly at the level of calculations of the five-year plan. The task of further developing work on land reclamation was set in the plan. At the same time, an overfulfillment of the pertinent assignments of the five-year plan was envisaged, to which the following indicators attest (in thousand hectares):

	According to the <u>annual plan</u>	According to the <u>five-year plan</u>
Putting irrigated land to use at the expense of state capital investments	862	767
Including irrigated pastures	258	102

Basically, the plan for 1975 also set the assignments for the growth of production and purchases of agricultural products at the level of the assignments of the five-year plan. Some livestock products were an exception owing to the insufficiency of the fodder base. Both the growth of production and increase in the purchases of agricultural products were to be attained through a rise in the standard of farming and animal husbandry and in the productivity of the latter, improvement in the structure of sown areas and advance in yield. For the first time in the plan for the RSFSR provision was made for assignments for an overall development of agriculture in the nonchernozem zone. Capital investments and material and technical resources were allocated specifically for this.

The program for an increase in capital investments and for the delivery of means of production to agriculture envisaged by the five-year plan was systematically realized in annual plans and often exceeded. Throughout the five-year period this made it possible to increase the utilization of funds for production construction in agriculture from all sources of financing to 113 billion rubles, which exceeded the assignment of the five-year plan. The total delivery according to annual plans of tractors (more than 1.7 million) and of trucks (more than 1.1 million) corresponded to the five-year plan.

With respect to the 10th Five-Year Plan we will examine the problem of combination of five-year and current planning, using the social program for 1976-1980 as an example.

As the 25th CPSU Congress determined, the main task of the 10th Five-Year Plan is to ensure a systematic implementation of the policy of the Communist Party for a rise in the people's material and cultural standard of living on the basis of a dynamic and proportional development of public production and increase in its efficiency, acceleration of scientific and technical progress, labor productivity growth and the maximum possible improvement in the quality of work in all national economic units.

For the solution of the main task of the 10th Five-Year Plan the basic trends in development envisage the following: a stable growth and improvement in the structure of public production; a system of measures for a rise in the people's standard of living; maximum possible increase in the efficiency of public production; improvement in the quality of output; intensification of the policy of economy in the national economy. Special attention is given to an acceleration of labor productivity growth.

The development of material production and increase in its efficiency are the basis for a wide program for social development and a rise in the people's standard of living. It includes a large range of measures concerning all the aspects of the work and way of life of the Soviet people.

The five-year plan mapped out the following basic indicators of rise in the standard of living of the Soviet people: real per-capita income, 21 percent; average monthly wages of workers and employees, almost 17 percent; wages of kolхоз members, 26 percent; public consumption funds, 30 percent; retail trade turnover, 29 percent; volume of domestic services, 1.5-fold. The plan also envisages a large increase in housing construction and the allocation of large appropriations for an improvement in the protection of the population's health, development of public education and environmental protection.

The annual plans of the 10th Five-Year Plan realize and specify its social program. Proceeding from the general social program of the five-year period, they envisage specific measures characteristic of a given year. We will briefly dwell on this problem.

The plan for 1976--the first year of the 10th Five-Year Plan--was approved by a session of the USSR Supreme Soviet in December 1975, that is, before the adoption of the Basic Trends in the Development of the USSR National Economy for 1976-1980. By that time, however, the work on the preparation of the 10th Five-Year Plan was completed in practice and the plan for 1976 fully corresponded to the five-year plan. The plan allocated 4.7 billion rubles for measures for raising the people's standard of living. These funds were used to increase the minimum wages, rates and salaries of workers in production sectors receiving average pay in all the country's regions. Furthermore, an increase in minimum wages to 70 rubles per month and in the rates and salaries of workers in nonproduction sectors receiving average pay began in a number of regions.

The plan for 1977 envisaged a continuation of the increase in the rates and salaries of workers in the nonproduction sphere. When the improvement in wages was made, special attention was drawn to an increase in the wages of workers employed in sectors and enterprises with trying and harmful working conditions. Additional pay for night work increased in a number of industrial sectors. Wage benefits for workers in individual regions of the European North expanded.

The plan for 1978 envisaged a continuation of the increase in the wages of workers of the categories mentioned, as well as of some categories of workers in ferrous and nonferrous metallurgy, the textile industry, agriculture and construction. Extensive measures for improving social and cultural services for the public were envisaged.

On the whole, during the first 3 years of the 10th Five-Year Plan state expenditures on the implementation of measures for raising the people's standard of living were envisaged in an amount of 9 billion rubles per year. This exceeded the corresponding calculations of the five-year plan by approximately 300 million rubles. Following the example of past years ministries and the Union republics were given the assignment to find the possibility of expanding the production of consumer goods and retail trade turnover by 3 billion rubles in excess of the approved plan for retail trade turnover (238 billion rubles).

New advances in the solution of the most important social problems and in the rise of the people's standard of living were made in 1979. During 4 years of the five-year plan (1976-1979) real per-capita income increased by 13.3 percent. The average monthly wages of workers and employees rose by 12.4 percent and the wages of kolkhoz members, by 21.7 percent, which corresponds to the assignments of the five-year plan for the period indicated.

Plans have been made to complete the introduction of new rates and salaries for workers in the nonproduction sphere in 1980. An increase of 2.9 percent in real per-capita income is envisaged. During the entire five-year plan it will increase by 16.6 percent. Measures are being taken to increase the wages of agricultural workers in the nonchernozem zone of the RSFSR, to pay increments for long service to railroad transport workers and so forth. Dwelling houses of a total area of 109.4 million square meters will be built, which will make it possible to increase the average provision of one urban dweller with a total apartment area of up to 12.9 square meters.

Thus, as an analysis of a number of major planning problems shows, on the whole, the complex task of coordinating five-year and current plans is being accomplished successfully. This is one of the manifestations of the optimality of our planning. However, the methodology of ensuring the unity of five-year and current plans, like the entire planning mechanism, of course, needs to be constantly improved and developed in the light of the new tasks and demands stemming from the present level of the national economy and the urgent needs of its development.

An even greater direction of the five-year plan toward the accomplishment of the long-term strategic tasks set by the party acquires special importance.

The importance of the coordination of five-year and current planning and of the intensification of their unity in all plan sections increases at the present stage in the development of the socialist economy as never before. An increase in the role of five-year plans presupposes a more profound and detailed study of its weather section; intensification of the balance coordination of the indicators of all the annual sections of the five-year plan on the basis of the utilization of the system of technical and economic norms and standards; creation of sufficient material and financial reserves; ensuring throughout the five-year period a stability of wholesale prices of industrial products, of estimated prices in capital construction and of rates of freight transport.

The five-year plan should more fully take into consideration the public needs for means of production and consumer goods and envisage wide measures for accelerating technical progress, increasing labor productivity and improving the quality of output. Counterplanning, which emerged during the years of the First Five-Year Plan and which contributes to the development of the initiative of production enterprises and associations, plays a special role in the elaboration of annual plans.

The dynamism of the USSR national economy, which is ever more closely integrated with the economy of CEMA countries, advances ever newer tasks in the area of the economic policy of the party and, accordingly, in the area of planning. Their accomplishment requires the further optimization of planning and improvement in the entire mechanism of socialist management. A systematic provision of the unity of five-year and annual planning plays the key role.

The coordination of the utilization of overall national economic programs in five-year and current planning is one of the urgent problems. As is well known, they are developed within the framework of a unified state plan for major scientific-technical, economic and social problems and are calculated for two or three five-year periods. The decree dated 12 July 1979 of the CPSU Central Committee and the USSR Council of Ministers envisages the development as the most important integral part of state long-range plans of overall scientific-technical, economic and social programs with their coordination with the appropriate plan sections and material and financial resources.

Of great importance is the intensification of the variance of planning on the basis of a wider use of mathematical methods in economics and of computers, but, of course, with correct methodological principles. This will make it possible to increase the scientific substantiation of both five-year and current planning, to expand the possibilities of finding new reserves within the framework of annual plans and thereby to create more favorable conditions for overfulfilling five-year plans.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" adopted on 12 July 1979 envisages a number of interconnected measures directed toward an intensified coordination of five-year and current planning. Intensification of the role of the five-year plan as the main form of planning and the basis for organizational and economic activity is the initial point. For this purpose it is envisaged that within the five-year plan for each year of the five-year plan:

balances of material and labor resources and of production capacities, the financial balance and the balance of the population's monetary income and expenditure are worked out;

Material and financial reserves and, in case of need, reserves of production capacities are formed according to the established standards;

economic standards, including of wage funds and material incentives, are approved.

Annual plans are to be developed on the basis of the assignments and economic standards of the five-year plan for a given year. At the same time, the task of specifying the indicated assignments, introducing the latest achievements of science and technology and implementing economic and organizational measures ensuring the overfulfillment of the five-year plan is set.

The USSR State Planning Committee accumulated extensive experience in ensuring the unity of five-year and current planning. A creative utilization of this experience will help in the accomplishment of the new complex tasks set by the party for planning under the conditions of developed socialism.

#### FOOTNOTES

1. V. I. Lenin, "Poln. Sobr. Soch." [Complete Works], Vol 42, p 344.
2. See: V. I. Lenin, "Poln. Sobr. Soch.," Vol 52, p 129.
3. "KPSS v Rezolyutsiyakh i Resheniyakh S'yezdov, Konferentsiy i Plenu-mov TsK" [The CPSU in the Resolutions and Decisions of Congresses, Conferences and Plenums of the Central Committee], Vol 8, Politizdat, 1972, p 526.
4. "KPSS v Rezolyutsiyakh i Resheniyakh S'yezdov, Konferentsiy i Plenu-mov TsK," Vol 4, Moscow, Politizdat, 1970, p 205.

5. "Pyatiletniy Plan Narodnokhozyaystvennogo Stroitel'stva SSSR" [Five-Year Plan for the National Economic Construction of the USSR], Vol 1, Moscow, Planovoye Khozyaystvo, 1929, p 129.
6. V. V. Kuybyshev, "Narodnokhozyaystvennyy Plan Tret'yego Goda Pyatiletki" [National Economic Plan of the Third Year of the Five-Year Plan], Moscow, OGI. [Association of State Publishing Houses], 1931, p 4.
7. PLANOVOYE KHOZYAYSTVO, 1930, No 12, p 29.
8. See: V. V. Kuybyshev, "Na Poroge Chatvertogo Goda Pyatiletki" [On the Threshold of the Fourth Year of the Five-Year Plan], Moscow-Leningrad, Partizdat, 1932, p 24.
9. See: "Itogi Vypolneniya Pervogo Pyatiletnego Plana Razvitiya Narodnogo Khozyaystva Soyuz SSSR" [Results of Fulfillment of the First-Five-Year Plan for the Development of the National Economy of the USSR], Moscow, Standartizatsiya i Ratsionalizatsiya, 1934, p 104.
10. "Narodnokhozyaystvennyy Plan na 1935 God" [National Economic Plan for 1935], Moscow, Gosplan SSSR, 1935, p 67.
11. See: "Narodnokhozyaystvennyy Plan na 1935, p 68.
12. "Narodnokhozyaystvennyy Plan na 1936 God" [National Economic Plan for 1936], Vol 2, Moscow, Gosplan SSSR, 1936, pp 37 and 50.
13. See: "Narodnokhozyaystvennyy Plan Soyuz SSSR na 1937 God" [National Economic Plan of the USSR for 1937], Moscow, Gosplan SSSR, 1937, pp 65, 71 and 81.
14. See: N. K. Baybakov, "O Gosudarstvennom Plane Razvitiya Narodnogo Khozyaystva SSSR na 1971 God" [State Plan for the Development of the National Economy of the USSR for 1971], Moscow, Politizdat, 1970, p 6. The indicators of annual plans cited below are taken from N. K. Baybakov's reports at the sessions of the USSR Supreme Soviet during the corresponding years.

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## INVESTMENT, PRICES BUDGET AND FINANCE

### MORE EFFICIENT UTILIZATION OF FIXED CAPITAL URGED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 4, Apr 80 pp 65-70

[Article by V. Abramov, candidate of economic sciences, Rostov-on-Don:  
"Improvement in the Utilization of Productive Capital and Socialist Competition"]

[Text] In his works on economic problems in socialist production V. I. Lenin assigned one of the most important places to competition. "Socialism," V. I. Lenin wrote, "not only does not extinguish competition, but, on the contrary, for the first time creates the possibility of using it really widely, really on a mass scale, and of really involving the majority of workers in an arena of work where they can manifest themselves, develop their abilities and display their talents—an untapped source among the people..."<sup>1</sup>

V. I. Lenin developed the scientific principles of competition—openness, comparability of results and the possibility for a practical repetition of experience.

The practice of socialist construction convincingly confirmed the correctness and fruitfulness of V. I. Lenin's teaching on competition. It encompasses ever newer aspects of our life and has a big effect on production.

It is remarkable that at present workers utilize competition as a means of attaining high economic indicators in honor of the 110th anniversary of V. I. Lenin's birthday.

The new initiative in socialist competition under the slogan "we will build ahead of schedule—we will master ahead of schedule!" undertaken by the workers and engineering and technical personnel of industrial enterprises, construction organizations and transport in Rostovskaya Oblast is one of the concrete expressions of the upsurge of workers' labor activity.

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1. V. I. Lenin, "Poln. Sobr. Soch." [Complete Works], Vol 35, p 195.

Following this initiative collectives of workers in the oblast undertook obligations for commissioning and mastering new production capacities ahead of schedule. At existing enterprises this movement is manifested in a competition for the maximum yield of every unit of equipment. L. I. Brezhnev gave a high rating to the patriotic movement of the people of Rostovskaya Oblast for the attainment of high practical results in the construction, mastering and utilization of production capacities, expressing confidence that the new initiative of workers in Rostovskaya Oblast will be disseminated on a mass scale throughout the country.

A full application of Leninist principles is the most important condition for the effectiveness of socialist competition. Their implementation requires appropriate indicators, according to which it is possible to give an objective evaluation of the work of those that compete, to disclose the potentials for improving their activity, to determine the best results of the winners in a competition and to make them available to other members of the collective.

Analyzing a number of indicators of the utilization of fixed productive capital from these standpoints, it should be noted that they do not sufficiently meet the demand to ensure the comparability of results of socialist competition, which lowers the possibility for the introduction of the experience of advanced workers.

Therefore, the initiative of a number of enterprises in the development of additional measures for raising the level of utilization of fixed productive capital and capacities and of new forms and indicators of planning, recording and evaluating the loading of equipment and on this basis developing competition for an increase in the capital-output ratio is extremely valuable. For example, the initiative of the Rostov State Bearing Plant No 10 under the slogan "a certificate of efficiency for every machine tool" has become widespread.

In accordance with the developed standard workers and foremen keep a record of downtime and the reasons for it for every machine tool and machine at production sectors. The coefficient of equipment loading is chosen as the basic indicator of extensive utilization of equipment. In the plan it is determined by dividing the time necessary for the fulfillment of the annual program of a shop during the operation of installed equipment in two shifts (total machine tool intensiveness of the program) by the actual (calculated) allocated annual time of operation of the same equipment (in hours). The total machine tool intensiveness is calculated on the basis of existing time norms with due regard for the progressive percent of their fulfillment and losses of time on readjustment. The shift coefficient calculated as the ratio of the total machine tool-shifts worked during the period under review to the amount of installed equipment per work day during the period under review is one of the frequent indicators of the utilization of equipment in time used at the State Bearing Plant No 10.

A daily record of equipment downtime and of the reasons for it makes it possible to uncover numerous potentials for improving its utilization.

At the same time, an analysis has shown that from the magnitude of equipment loading and shift coefficients it is not yet possible to judge the efficiency of equipment operation, bearing in mind the volume of output.

Solving the problem of economic substantiation of socialist competition for an increase in the capital-output ratio, the Sumy Machine Building Production Association imeni M. V. Frunze made an attempt to find indicators that could characterize the efficiency of utilization of fixed productive capital, at the same time, eliminating the effect of the cost of materials and purchased articles, and ensure comparability during a comparison of the activity of several production subdivisions. The indicator of labor intensiveness of output in norm-hours began to be used in all shops except for foundries and a physical indicator, that is, 1 ton of castings per square meter of production area, in foundries. The normative production capacity, by which the maximum possible output by a shop or sector with a two-shift loading of equipment, a full utilization of areas and the work time and a technically substantiated level of labor productivity under given specific conditions is meant, is calculated by means of the above.

For example, the normative capacity of machine shops depends on the installed number of machine tools in a certain subdivision, the normative equipment shift coefficient, the nominal allocated time in terms of one-shift work and the level of fulfillment of output norms (during the base year) and assignments for lowering labor intensiveness.

The amount of equipment is determined according to the availability of installed machine tools in shops (sections) at the beginning of the year. The normative equipment shift coefficient is calculated on the basis of the planned shift coefficient and the time allocated for the repair of equipment. The planned shift coefficient is determined on the basis of the calculation of the production capacity for the planned year as the weighted mean in a shop (section). For the purpose of comparing the results of operation of intraplant subdivisions according to the level of equipment loading and ensuring an equal intensity of production assignments, the planned shift coefficient for the same groups of equipment is the same for all basic shops and sections. Two-shift operating conditions are applied to most types of equipment. At sections with a longer period of operation the planned shift coefficient is more than two. For special-purpose equipment the planned shift coefficient is determined according to the actual load and can be below two.

Since the coefficient of fulfillment of output norms is taken at the level of that obtained during the base period, the calculation of normative production capacity includes a planned assignment for lowering labor

intensiveness in norm-hours. A method of determining the normative production capacity of forging and pressing and set-up shops and foundries was developed in the association.

The coefficient of intensity of the production activity of shops and sections was introduced for an evaluation of the degree of utilization of normative capacity. It is calculated by dividing the output (in norm-hours) actually produced on given equipment by normative capacity. The level of utilization of the normative capacity of intraplant subdivisions is the criterion for an evaluation of their work on the utilization of fixed productive capital. It also serves as the criterion for determining winners in intraplant socialist competition and the amounts of bonuses to workers.

The method of calculating normative production capacity adopted in the association has a number of advantages as compared with the existing method. As is well known, the maximum possible annual output or the volume of raw material processing in a certain nomenclature and assortment with a complete utilization of production equipment and areas and with due regard for the use of advanced techniques and improvement in the organization of production and labor is meant by the production capacity of an enterprise (shop or section). From this definition it follows that the calculation of the production capacity of an enterprise does not allow for an incomplete loading of equipment. However, the calculation of production capacity "according to the leading unit" contradicts its definition.

At machine building and other enterprises many shops are considered leading shops. They include assembly, machine assembly, machine and forging and pressing shops, foundries and so forth. The following question arises: According to which of these shops should the production capacity of an enterprise be established?

In practice, the capacity of an enterprise is established not according to the highest level of capacity among leading shops, but according to the lowest. The capacity of a shop is established according to the smallest capacity of one of the leading sections and the capacity of a section, according to the smallest capacity of one of the leading groups of equipment or a leading unit. At the same time, part of the installed equipment or basic shops—sometimes a very big part—remains not fully loaded. For example, at the Rostsel'mash Plant in 1978 the average annual coefficient of equipment loading in machine assembly shops was as follows: in shop No 1--0.535; No 3--0.602; at the Krasnyy Aksay Cultivator Plant: in the machine assembly shop No 22--0.67; in the hardware shop--0.69 and so forth. At the same time, the unloaded part of equipment is not included in the calculation of production capacity, which lowers its level and decreases the possibility of obtaining output from fixed productive capital.

Thus, in a number of cases the principle of calculation of capacity according to the leading unit is transformed into the determination of the capacity of an enterprise according to the lowest level of capacity established for leading shops. It not only does not place obstacles to the accumulation of equipment not fully utilized in the process of production, but, on the contrary, produces an increase in it.

The indicator "normative production capacity" adopted in the Sumy Machine Building Association is determined not according to the leading unit, but on the basis of the maximum load of the predominant amount of equipment during two-shift operation. It corresponds much more to the essence of the concept of production capacity as the maximum possibility for the production of products with a full utilization of equipment.

The association has taken a major step forward in the use of the normative method of planning. This is expressed in the development of the same requirements on shops and sections, which is the basis for a uniform approach to an evaluation of the results of their operation and for a comparison of the results of socialist competition for an improvement in the utilization of fixed productive capital.

In our opinion, the experience of the Sumy Association in the calculation of production capacity by the normative method will become widespread. Its use will make it possible to attain a fuller loading of equipment.

During the Ninth Five-Year Plan the capital-output ratio at the plant increased by 13.4 percent and the volume of output per square meter of production area, by 31.6 percent. The shift coefficient rose from 1.55 in 1975 to 1.66 in 1978. As a result of the increase in the yield of equipment, rise in output per unit of production area and reduction of work time losses, in 1978 additional output, as compared to the plan, worth 1.9 million rubles was ensured and about 1 million rubles of above-plan profit were obtained.

Noting the positive aspects of the system of improvement in the utilization of fixed productive capital in the Sumy Association, it should be noted that its individual points need to be further improved. In particular, this applies to the establishment of a time standard for the repair of equipment, which is made with a deviation from the principle of equal intensity of plans. It is well known that the statutes in effect establish different time norms for repair for different types of equipment. A single plant standard (10 percent of the planned time) has already been approved in the association. Thereby, intraplant production subdivisions have been placed under unequal conditions. The shops (sections) for which low sectorial standards for the repair of less complex equipment have been established will be in a more advantageous position than shops (sections) with complex equipment, where the sectorial standards for its repair are higher.

The developed indicators of standardized production capacity, organization of socialist competition and material incentives for an improvement in the utilization of fixed productive capital find application only in intraproduction subdivisions (shops, sections and shifts). On the whole, however, this system of evaluation of the level of utilization of fixed productive capital is not used in the association. In our opinion, the application of the system of indicators and evaluation of the efficiency of utilization of production capacities and socialist competition for an increase in their yield to the production association as a whole, which will make it possible to compare the operation of enterprises, not only of shops and sections, will be the further development of this system.

The practical experience of the USSR Ministry of Tractor and Agricultural Machine Building, where a system of evaluation of plan intensity is used, deserves attention. Standards of equipment loading and utilization of production capacity equal to 0.80 and 0.95 respectively, which are the same for all the sector's associations and enterprises for the 10th Five-Year Plan under two-shift operating conditions, are the elements of this system. An evaluation of the activity of an enterprise depends on the attainment of the established standards. Such an approach to planning expresses to the greatest extent the principle of equal requirements on all associations and enterprises in accordance with their capabilities.

The standard of equipment loading established in the ministry reflects the characteristics of mass, large-series and series production in a sector. At the same time, it is higher than the attained level of equipment loading at enterprises. With regard to the standard of utilization of production capacity, in most enterprises it has been exceeded.

The coefficient of utilization of production capacities at the sector's enterprises approaches a unit and, at the same time, equipment is not fully loaded. Therefore, from the indicator of utilization of capacity it is impossible to judge whether the operation of fixed capital is efficient. Thus, the use of any one of these indicators does not direct an enterprise toward a complete utilization of fixed productive capital, does not give a reliable description of the capital-output ratio and does not create conditions for comparing enterprises according to the level of the latter. Therefore, an overall approach to the evaluation of the capital-output ratio has been adopted in the USSR Ministry of Tractor and Agricultural Machine Building.

In order to make it possible to compare the results of work of enterprises and the results of socialist competition, several standards (coefficients of equipment loading, utilization of production capacity and so forth) were adopted and a point system of evaluation of plan intensity was introduced. A four-point evaluation is given for the attainment of the established standard by an enterprise. It increases to five points when it is exceeded and decreases when it is lowered. Scales of correspondence of points to the attained level for each indicator were developed

and approved. On the basis of the obtained points for all the planned standards the average number of points is calculated, forming the basis for an evaluation of the intensity of the plans of an enterprise and for its incentives.

An investigation of the discussed problems makes it possible to draw the following conclusion. To intensify the economic substantiation of socialist competition for an increase in the capital-output ratio, it is necessary to expand and improve the indicators of utilization of fixed productive capital and to keep a systematic record of the operation and downtime of equipment. An analysis of the work done in the Gury Machine Building Production Association imeni M. V. Frunze, the Rostov State Bearing Plant No 10 and the USSR Ministry of Tractor and Agricultural Machine Building attests to the value and usefulness of their experience and to the fact that it is possible to establish an overall system of indicators of planning and recording the utilization of equipment and production capacities, which can ensure the comparability of the results of socialist competition.

In our opinion, the following should be included in such a system: standards (coefficients) of equipment loading and utilization of production capacity unified and equal for all the enterprises and associations of an industrial sector (groups of sectors); point evaluation for comparing the results of work and the results of socialist competition given several planning indicators (standards) for the utilization of fixed productive capital, as well as the labor intensiveness of output and physical indicators used for a description of the production volume; normative production capacity; evaluation of the intensity of production activity of shops and sections.

When normative production capacity is calculated, the problem of utilization of the third (night) shift of enterprise operation acquires great importance. Its solution depends on the specific conditions and tasks of socialist construction. The role of social factors increases during the period of developed socialism. Along with the problems of increasing production efficiency, the problems of creating the best conditions for man's overall development, rise in his education and political and cultural level and workers' active participation in social work are put in the forefront. The transfer of a number of enterprises from three-shift to two-shift operating conditions should also be examined from these standpoints.

The night shift is the hardest and most difficult and the least productive. Three-shift work is one of the reasons for the labor turnover. When there are two shifts, favorable conditions for the utilization of free time for development and rest are created for workers, which, in turn, contributes to an increase in their labor activity and to labor productivity growth. Two-shift, as compared with three-shift, work provides better opportunities for studies and for the organization of cultural

leisure and social activities. The loading of equipment in two shifts makes it possible to carry out preventive inspections and current repairs at night time. As a result, the downtime of equipment caused by its disrepair is shortened and its operation during day hours improves.

Thus, reducing the number of nightshifts and, accordingly, of the workers employed in them is an important task of enterprises, associations and ministries. The utilization of night shifts cannot be considered a reserve for increasing the loading of equipment.

From the above stated it follows that, when planning normative production capacity, as a rule, it is necessary to proceed from two-shift conditions of equipment operation. The differences in the capacities of equipment, shops and sections at an enterprise should also be taken into consideration. To level out these differences, a coefficient characterizing the time of equipment operation with due regard for equipment downtime can be used.

On the basis of the above-stated we propose to calculate the normative production capacity  $M_n$  of the machine shops and sections of enterprises according to the following formula:

$$M_n = T_a K_{a,n} (1 - K_d) + T_{a,r},$$

where  $T_a$  is the total annual actual (calculated) time of equipment operation, hours;  
 $K_{a,n}$  is the coefficient of fulfillment of output norms during the base year;  
 $K_d$  is the planning coefficient reflecting the proportion of losses of the time of equipment utilization owing to a disproportion of capacities in the total magnitude of the actual (calculated) allocated time;  
 $T_{a,r}$  is the planning assignment for lowering the labor intensiveness of output, norm-hours.

As the experience of the Rostov State Bearing Plant-10 indicates, it is advisable to introduce an indicator of equipment operation and downtime according to the reasons for it. To generalize the results of such a record, the use of the coefficient of actual equipment loading  $K_{\phi}$  is recommended. It is established according to the following formula:

$$K_{\phi} = \frac{T_a - T_{unpl}}{T_a},$$

where  $T_{unpl}$  is unplanned equipment downtime, hours.

In our opinion, the examined system of indicators will contribute to the further development of socialist competition for an increase in the efficiency of utilization of fixed productive capital.

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## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

### STATISTICAL ANALYSIS OF TECHNOLOGY IMPACT ON CAPITAL YIELD

Moscow **Ekonomika i Matematicheskiye Metody** in Russian No 2, Mar-Apr 80  
pp 258-271

[Article by V. K. Pal'taman and V. N. Borisov, Moscow: "Statistical Analysis of the Impact of Technology on the Output-Capital Ratio and Capital-Intensiveness of Investment Sectors"]

[Text] Potential ways to increase the rate of economic growth include overcoming the unfavorable trend toward less efficient use of fixed productive capital and capital investment, stabilizing and then even reducing capital-intensiveness (*kapitaloemkost'*) and raising the output-capital ratio (*fondeotdacha*). This requires development of techniques for active control of capital-intensiveness and the output-capital ratio.

Existing approaches to their analysis and forecasting differ chiefly in the factors that make them up. As the diagram below shows, the indexes

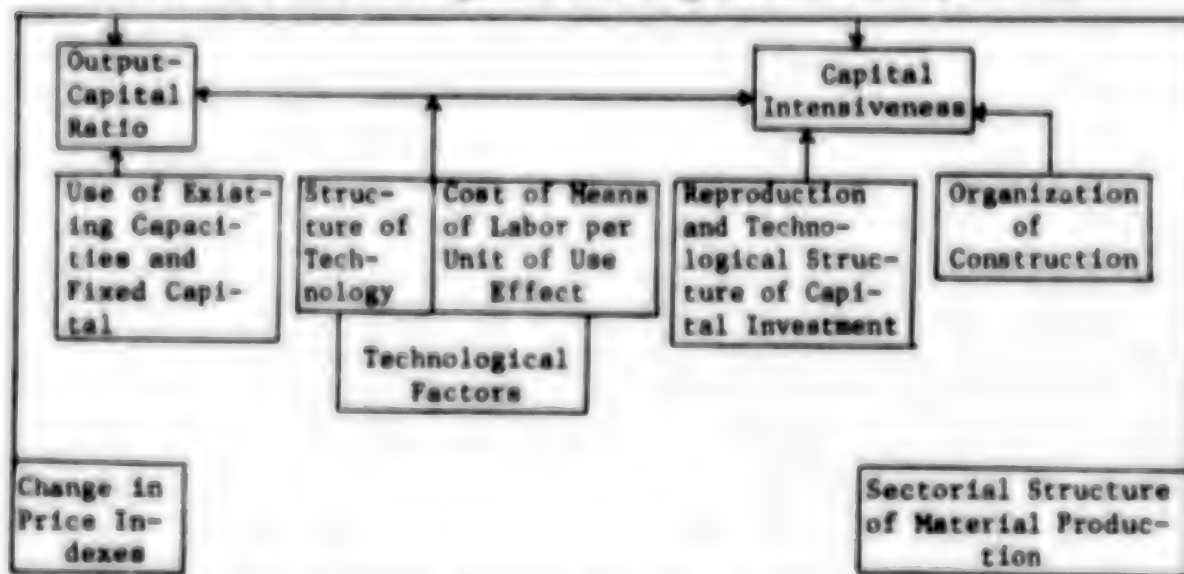


Diagram of the Principal Factors That Shape Changes in Output-Capital Ratio and Capital-Intensiveness of Output

of the output-capital ratio and capital-intensiveness depend on the structure of the technologies of the sectors of material production (in particular in the investment sectors), which may be asset-["fondy"] and capital-["kapital"] intensive or asset- and capital-conservative. The variation in these indexes for the same technology depends on the cost of means of labor per unit of use effect.

The output-capital ratio and capital-intensiveness form at the national economic level under the influence of the sectorial structure of material production and are affected by change in price indexes. In addition to these factors which are common to the output-capital ratio and capital-intensiveness, there are also specific factors. For example, the output-capital ratio depends on the use of existing production capacities, fixed capital as a whole and its active part — the stock of equipment. In its turn, capital-intensiveness may change under the impact of the reproduction and technological structures of capital investment. Specific capital investment grows if that part which is directed to compensation for liquidation of fixed capital in the process of reconstruction and technical-reequipping is increased. Where there is equivalent replacement of assets this circumstance may not be reflected in the output-capital ratio of the sector.\*

Finally, the capital-intensiveness of output depends on the organization of construction work: reducing construction time and the volume of incomplete construction. The magnitude of specific capital investment also depends on combining the economic and contract methods of construction and on the scale of projects being built.

Changes in capital-intensiveness and the output-capital ratio are interrelated, but factors distinctive to each of these indexes affect the relationship. In addition to the commonplace situations where changes in the indexes move in different directions and testify to synchronous change in the effectiveness of current and accumulated investment, cases also occur frequently in practice where the figures for both the output-capital ratio and capital-intensiveness increase or decrease together.

The output-capital ratio may increase with a simultaneous increase in specific capital investments, for example if the absolute magnitude of capital-intensiveness is less than the average sectorial asset-intensiveness. But when this condition is not observed, growth in the output-capital ratio may be secured by fuller use of existing assets while capital-intensiveness may increase as a result of accelerating the processes of compensation for liquidation of assets, growth in the

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\* Equivalent replacement means that a unit of the fixed capital being replaced and the unit being launched in its place have the same capacity.

volume of incomplete construction, and others that do not affect the output-capital ratio of the factors.

The vast literature on the problems of the efficiency of capital investment and fixed capital have given most detailed analysis to such factors as the sectorial structure of material production, use of existing production capacities and assets (degree of incorporation of projected capacities, increase in the shift coefficient of equipment), reproduction and technological structure of capital investment, and organization of construction work, including reducing construction time and incomplete construction. As for the technological factor, the structure of technologies and changes in the cost of means of labor per unit of use effect for particular technological processes, despite general acknowledgement of the importance of their impact on change in the output-capital ratio and capital-intensiveness, it is little-studied.

Technological changes usually appear in analysis as a residual factor which is made to account for everything not explained by other causes. On the one hand, reference is made to the impossibility of anticipating change in the output-capital ratio on the sole basis of an analysis of established trends and the need to consider in the prognosis not just sectorial structure but also technical progress, which is "one of the decisive factors in effecting change in the output-capital ratio" [1, pp 59, 109-116]; on the other hand, the inadequacy of the treatment of technical aspects in economic forecasting of the output-capital ratio and the contradictory nature of the conclusions of various studies of the impact of technical progress on the output-capital ratio on a macroeconomic level are stressed [ibid., pp 59-65, 114].

Work [2] proposes a standard methodology of factor-based planning and analysis of the output-capital ratio containing two types of models. The first type links the magnitude of the output-capital ratio of a sector to indexes of material-intensiveness, productivity of equipment, its average value, the shift coefficient of equipment, and the proportion of all fixed capital that is equipment. In the other model the predictors (independent variables) are material-intensiveness (ratio of gross and hypothetical net output), labor productivity of workers relative to hypothetical net output, shift coefficient of workers, capital-labor ratio, and proportion of active part of fixed capital in all fixed capital. This technique does not permit measurement of the effect of changes in the structure of technology on the output-capital ratio, apparently because of the lack of information on the technological structure of production.

The purpose of the present article is to demonstrate one possible approach to analysis of the impact of technological factors on capital-intensiveness and the output-capital ratio using the example of the sectors of the investment complex. The article will consider four

sectors of this complex: machine building and metalworking; construction; the building materials industry; ferrous metallurgy.

The investment complex has a significant share of the country's national economy. It accounts for roughly one-quarter of the fixed capital and capital investment. The complex produces more than 40 percent of the output of material production [3]. And in this complex, as in the economy as a whole, while there was significant growth in labor productivity in the period 1966-1975 (2.2 times in machine building and metalworking, 1.6 times in construction and ferrous metallurgy, and 1.7 times in the building materials industry [3, pp 51, 113, 213]), a drop in the output-capital ratio and growth in capital-intensiveness were observed (see Table 1 below). During this time capital-intensiveness of output rose for all four sectors, especially in construction (almost doubled), while the output-capital ratios dropped in all the sectors except machine building.

Development of a technique for analyzing the influence of changes in technology on change in the output-capital ratio and capital-intensiveness required that the following problems be solved: (1) eliminating the effects of all factors except technological ones on the indexes under study; to do this the part common to the two indexes that is formed entirely under the influence of technological factors was identified; (2) identifying the makeup of key factors and their unique correspondences to changes in the structure of fixed capital and capital investment; (3) formulating ways to estimate the contribution of the factors to changes in the indexes under study.

To eliminate the impact of change in the consolidated structure of material production on change in the output-capital ratio and capital-intensiveness, indexes were analyzed separately for each of its sectors  $j$ ,  $j = 1, \dots, J$  and then the contribution of change in the structure of material production to this change in index was evaluated.

The effect of the price factor was eliminated by calculating the output-capital ratio and capital-intensiveness in comparable prices. The analysis was made for 1966-1975. To account for the impact of double counting, the indexes of capital-intensiveness and the output-capital ratio were figured first for gross output and then for hypothetical net output, whose magnitude was determined in constant 1 July 1967 prices as the difference between gross output and the material input contained in it. Capital investments were calculated in 1 January 1969 estimate prices, while fixed capital was figured at 1972 replacement cost, which was also based on 1 January 1969 prices. However, because of the imperfections of techniques for calculating price indexes (especially for capital inputs and assets) and differences in the technique of calculating these indexes for output and fixed capital, it was not possible to entirely exclude the impact of the price factor.

Table 1. Change in the Output-Capital Ratio and Capital Intensiveness of Sectors of the Intensiveness of Sectors of the Investment Complex (Indices were calculated for gross output in prices as of 1 July 1967, with a one-year lag for capital intensiveness; the calculations were made using data from [3, pp 57-60, 197, 223, 502, 506-508]).

Sector	Output-Capital Ratio, Index of Change in rubles/rubles		Output-Capital Ratio, 1975/1966		Capital-Intensiveness, rubles/rubles		Index of Changes in Capital-Intensiveness 1971-1975/1966-1970	
	1966	1975			1966-1970	1971-1975		
Entire Investment Complex	1.85	1.69		0.91	0.70	0.81		1.16
included in above								
Machine- building and Metalworking	1.72	1.94		1.13	0.57	0.60		1.05
Construction	3.76	2.32		0.62	0.61	1.19		1.95
Building Materials Industry	1.19	1.07		0.90	0.83	0.90		1.08

The indexes of the output-capital ratio and capital-intensiveness were calculated at first for all capital investments and assets, and then for capital investments to purchase equipment and the active part of assets. This approach made it possible to estimate the contribution of change in the technological structure separately, and then to make a calculation without considering the effect of this factor.

To exclude the effect of change in expenditures to compensate for withdrawal of fixed capital and changes in balances of incomplete construction and non-capital-forming ["nefondooobrazuyushchikh"] elements of capital investment which are not related to change in the output-capital ratio, on the formation of capital-intensiveness, it is wise to analyze capital-intensiveness for net capital investment.

Net capital-intensiveness  $r_j$  is calculated as

$$r = \frac{K_j - W_j \pm \Delta O_j - N_j - R_j}{\Delta P_j} \quad (1)$$

where  $r_j$  is the net capital-intensiveness of sector  $j$  (for capital investment for the purchase of equipment);  $K_j$  is capital investment during period  $t$ ;  $W_j$  is expenditures to compensate for liquidation of fixed capital;  $\Delta O_j$  is change in the balance of incomplete construction at the end and beginning of period  $t$ ;  $\Delta P_j$  is growth in production capacities (volume of production of output) resulting from the introduction of capital in the particular sector through  $K_j$ ;  $N_j$  is non-capital-forming capital investment;  $R_j$  is uncompensated transfer of assets introduced through capital investment  $K_j$  to other sectors; the numerator in (1) describes the amount of net capital investment in the sector directed to accumulation of assets.

The index of net capital-intensiveness corresponds to the index of incremental asset-intensiveness and  $f_j'$

$$f_j' = \frac{\Delta F_j}{\Delta P_j} \quad (2)$$

where  $\Delta F_j$  is growth in the active part of assets in the given sector through capital investment  $K_j$ .

If we disregard the difference in definitions and degree of extent of sectors which occurs in the actual statistics of capital investment and fixed capital and makes them not completely comparable, the shifts in time that exist between the introduction of assets and their partial transfer to other sectors, and the fact that a small part of the increase in the active part of assets forms through installation and construction work (expenditures for installation of equipment, construction of foundations and barriers), then  $r_j = f_j'$ . In reality, this equality is only observed in a more or less approximate fashion. For example, in machine building in 1971-1975  $r = 1.0$  and  $f' = 1.1$ ;

the corresponding figures in ferrous metallurgy were  $r = 5.5$  and  $f' = 6.2$ , while in construction they were  $r = 1.3$  and  $f' = 1.8$ , and in the building materials industry  $r = 2.3$  and  $f' = 2.2$ .<sup>\*</sup> Change in net capital-intensiveness coincides better with change in incremental asset-intensiveness than their absolute values coincide. Thus, the indexes of change for these indexes, calculated for the Ninth Five-Year Plan in relation to the Eighth, were  $I_r = I_{f'} = 1.2$  for machine building,  $I_r = I_{f'} = 1.4$  for ferrous metallurgy,  $I_r = I_{f'} = 1.94$  in construction, and  $I_r = I_{f'} = 1.8$  for the building materials industry. Therefore, the object of analysis for the impact of technology was not the absolute values of the indexes of the output-capital ratio and capital-intensiveness, but rather their change over time expressed in indexes of change.

The development of technology leads to solving the problem facing sectors such as incorporating the production of new output, saving labor (among the labor-saving technologies, for example, is full mechanization), improving working conditions (for example by automation), saving materials (materials-saving technologies, in particular no-waste technologies), transferring production to little-developed regions, environmental protection (ecology-saving technologies), development of science (science-intensive technologies), and so on.

In view of the purposeful nature of change in technologies, the analysis of their impact on the output-capital ratio and capital-intensiveness in planning is best done for the national economic complexes that are oriented to the accomplishment of final results.

Changes in production technology are based on corresponding changes in the natural-substantive (type) structure of capital investment and the active part of assets (equipment). The first thing is to establish the structure of fixed capital and capital investment, and single out those types of equipment which are linked to important technological changes. This type of structural analysis has been done in the USSR in the form of the comprehensive equipment balance [4]. About 90 physical-cost and 30 consolidated cost headings for equipment are singled out in the investment matrices of the balance. The degree of differentiation of type structure attained made it possible to reflect the following changes in technology (technological factors) in the calculation (see Table 2 below).

Change in the index for the cost of a unit of capacity (productivity) of equipment was studied for those types for which the necessary

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<sup>\*</sup>The indexes were figured for increments of hypothetical net output and net capital investment using information from the balance of industrial production fixed capital.

Table 2. Relationship Between Technologies and Trends in Deliveries of Equipment.

Type of Progressive Technological Processes	Type of Equipment Whose Share in Deliveries and Total Stock is:		
	Increasing	Decreasing	
Progressive Methods of Shaping in Machine Building	Forge-Press, Welding, Rolling	Metal-Cutting Lathes	
Production of Output of Fourth and Subsequent Conversions in Ferrous Metallurgy	Rolling, Thermal	Blast Furnace and Smelting	
High-Grade Metallurgy	Forge-Press, Electrosmelting	-	
Continuous Steel Pouring	Continuous Steel Pouring Installations	-	
Oxygen Converter Method of Steel Production	Oxygen	Smelting	
Industrial Methods of Construction	Equipment To Produce Reinforced Concrete Components, welding	-	
Use of Cast-in-Site Reinforced Concrete and Conventional Concrete in Construction	Pumps	Equipment to Produce Reinforced Concrete Components	

(Table continued next page)

(Table 2 continued)

Type of Progressive Technological Processes	Type of Equipment Whose Share in Deliveries and Total Stock is:		
	Increasing	Decreasing	
Mechanization of Earth Work in Construction	Excavators, Bulldozers, Scrapers, Graders	-	
Mechanization of Hoisting and Transportation	Hoisting-Transport	-	
Automation of Production	Automation Equipment, Devices, Computers, Automatic Lines, and Manipulators, Machine Tools with Digital Program Control	-	

statistics were available. The impact of investment in science and environmental protection measures was evaluated by the total volume of capital investment allocated for these purposes.

We will adopt the following conventional designation to present the methodology for evaluating the contribution of the factors:  $B_t$  is gross output of the sector in constant prices, millions of rubles;  $P_t$  is hypothetical net output of the sector in constant prices, millions of rubles;  $F_t$  is average annual industrial production fixed capital of the sector at replacement cost, millions of rubles;  $D_t$  is the active part of average annual industrial production fixed capital of the sector, replacement cost, millions of rubles;  $K_t$  is capital investment in the sector in comparable prices, millions of rubles;  $Q_t$  is capital investment in the sector for purchase of equipment in comparable prices, millions of rubles;  $h_{ti}$  is the stock of equipment of group  $i$  in comparable prices, millions of rubles;  $q_{ti}$  is deliveries of equipment of group  $i$  and comparable prices, millions rubles;  $i$  is the index of the group of equipment  $i = 1, \dots, m$ ;  $t \in (1, \dots, 11)$ , where  $t = 1$  corresponds to 1966.

The output-capital ratio of the sector was calculated by the formula  $f_t = B_t/F_t$ ; capital-intensiveness for the first five-years was calculated by the formula

and analogously for the second five-year plan. The sectorial indexes of change in the output-capital ratio  $I_f$  and capital-intensiveness  $I_r$  were defined as

$$I_f = \frac{B_{11}}{F_{11}} / \frac{B_1}{F_1}, \quad I_r = \frac{\sum_{i=1}^{11} K_i (B_i - B_1)}{\sum_{i=1}^{11} K_i (B_{11} - B_1)}. \quad (3)$$

The purpose of the analysis was to expand  $I_f$  and  $I_r$  into components that reflect the role of particular factors. The analysis consists of the procedures

$$I_f' = \frac{D_{11}}{D_1} / \frac{F_{11}}{F_1}, \quad I_r' = \frac{\sum_{i=1}^{11} K_i}{\sum_{i=1}^{11} K_i} / \frac{\sum_{i=1}^{11} Q_i}{\sum_{i=1}^{11} Q_i}, \quad (4)$$

$$I_f'' = \frac{B_{11}}{B_1} / \frac{P_{11}}{P_1}, \quad I_r'' = \frac{P_{11} - P_1}{P_1 - P_1} / \frac{B_{11} - B_1}{B_1 - B_1}, \quad (5)$$

$$u_{j,t} = u_{j,t-1} + \frac{P_{10}h_{1,t} - P_1h_{10,t}}{D_1P_{10}}, \quad u_{j0} = \frac{P_1}{P_{10}D_1} \sum_{i=1}^n h_{10,i,t} \quad (6)$$

$$u_{r,t} = u_{r,t-1} + \frac{(P_{11} - P_1) \sum_{i=1}^n q_{1i,t} - (P_1 - P_1) \sum_{i=1}^n q_{1i,t}}{(P_{11} - P_1) \sum_{i=1}^n Q_i}, \quad (7)$$

where

$$u_{r0} = \frac{P_1 - P_1}{(P_{11} - P_1) \sum_{i=1}^n Q_i} \sum_{i=1}^n \sum_{j=1}^n q_{1i,j}, \quad I_{j,t} = \frac{u_{j,t}}{u_{j,t-1}}, \quad I_{r,t} = \frac{u_{r,t}}{u_{r,t-1}}, \quad (8)$$

where  $I'_{f(r)}$  is the index of change in the technological structure of the average annual industrial production fixed capital (capital investment);  $I''_{f(r)}$  is the index of change in double counting in computation of gross output;  $I_{f(r)1}$  is the index of the effect of group 1 equipment on the output-capital ratio (capital-intensiveness) of the output of the sector.

As a result we have

$$I_j = I'_j I''_j I_{j,1} \prod_{i=1}^n I_{ji}, \quad (9)$$

$$I_r = I'_r I''_r I_{r,1} \prod_{i=1}^n I_{ri}, \quad (10)$$

where  $I_{f,1}(r,1)$  characterizes the role of other factors not considered in the calculations ( $I_{f,1} = u_{f,m}$  and  $I_{r,1} = u_{r,m}$ ).

In addition to the index method, regression relationships were used in the analysis.

Let us look at the interpretation of certain results of the analysis. The effect of the technological structure of capital investment and assets on the investment indexes of their efficiency in the period under consideration was defined by a decrease in the share of machinery, equipment, instruments, tools, and furnishings in machine building and ferrous metallurgy, whereas the share of the active part of investment increased in the building materials industry. There was little change in the share of equipment in current and accumulated investments in these sectors, just 1-2 percent. This process is more vigorous in construction and moved in different directions for fixed capital and

capital investment. Despite growth in expenditures for equipment purchase from 65 percent in the Eighth Five-Year Plan to 67 percent in the Ninth Five-Year Plan in construction, the share of the active part of assets dropped from 68 percent in 1966 to 64 percent in 1975. The total effect of change in the technological structure of capital investment and fixed capital in the investment complex was expressed in a decrease of roughly one percent in the output-capital ratio and two percent in capital-intensiveness. In machine building and ferrous metallurgy a slight worsening of the technological structure caused a drop of 2-3 percent in the output-capital ratio and an increase of 2-4 percent in capital-intensiveness. In the building materials industry the growth of the share of the active part of investment had a positive effect on the efficiency of fixed capital and capital investment, increasing their return slightly. In construction both the output-capital ratio and capital-intensiveness dropped as a result of this factor.

Some results of changes in the technological factor are shown in Table 3 below. It is apparent that in machine building progressive methods of shaping aimed at replacing metal-cutting technology, accelerated development of machining by pressure and welding, expansion of the sphere of application of precision casting, and stamped, rolled, bent, and welded shapes and semifinished parts, in other words steps aimed at the development of semifinished production and low-space and no-waste metal shaping technologies, had a large impact on raising the efficiency of capital investment and fixed capital. For example, replacing steel castings with stamped parts makes it possible to significantly reduce the capital-intensiveness of machine building output. The capital-intensiveness on one ton of finished products from machine shops made using steel castings is about 2,000 rubles; for high-grade stamped rolled products taking into account capital investments in ferrous metallurgy capital-intensiveness is 1,700 rubles [5, pp 97-98]. The author of this calculation made the assumption that specific capital investment in these machine shops for both alternative technologies remains constant at 600 rubles per ton of machine parts. If this assumption is set aside and it is additionally considered that an average of 30 percent more shavings must be removed from steel castings in the manufacture of machine parts than where they are produced from stamped parts, the specific capital investment in machine shops is 525 rubles for parts made of stamped parts and 675 per ton for castings. Thus, the totals for finished parts will be 1,600 and 2,100 rubles per ton respectively.

In finished machine building output one ton of cast parts is the equivalent of 0.6-0.8 tons of stamped parts. Therefore, the specific capital-intensiveness of machine parts calculated per years of final machine building output is 2,100 rubles per ton for cast parts and about 1,100 for stamped parts. Thus, the switch from casting processes to pressure metalworking cuts the capital-intensiveness of machine building output almost in half.

Table 3. Effect of Most Important Technological Changes on the Output-Capital Ratio and Capital-Intensiveness of the Investment Complex, in percentage

Technological Changes	Machine Building		Ferrous Metallurgy		Construction	
	A	B	A	B	A	B
Actual Change in Index Calculated for Active Part of Investment and Assets	+100	+100	-100	+100	-100	+100
in above figure, by rapid development of:						
Progressive Methods of Shaping in Machine Building	+87	-100				
High-Grade Metallurgy, Production of Output from Fourth and Subsequent Conversions			-65	+45		
Industrial Methods of Construction					-9	+12
Mechanization of Lifting and Transport Work					-12	+16
Mechanization of Earth-moving Work					-32	+18
Automation of Production	-6	+200	-6	+10	-5	+6
Production Infrastructure			-12	+31	-21	+39
Other Factors	+19	0	-18	+14	-21	+9

Note: A — Output-Capital Ratio; B — Capital-Intensiveness;  
+ — Growth of Index; - — Decrease of Index.

Improvement in shaping technologies to make the parameters of semi-finished parts closer to those of the finished article makes it possible to save investment for machine tool purchases. Thus, while capital investment for equipment in machine building rose 1.7 times

in 1966-1975, expenditures to purchase machine tools in conformity with the comprehensive balance rose just 1.5 times; capital investment to develop the stock of forge and press machinery increased at the same time. The cumulative effect of this factor, as is apparent from Table 3 and the calculations cited above, led to a decrease in capital-intensiveness and a rise in the output-capital ratio. The factor of cost of a unit of capacity of metalworking equipment did not appear to have a large impact on savings of investment and fixed capital. Thus, in the Ninth Five-Year Plan the average cost of a unit of capacity of metal-cutting machine tools, figuring from change in their productivity and the average price of a single machine tool, did not drop more than five percent.

The conclusion that progressive shaping technologies are asset-conserving was confirmed by space-time sampling done for two machine building sectors. In one of them the share of machine tools in the stock of metalworking equipment averaged 74 percent and the output-capital ratio was 2.3 rubles/rubles. In this case the share of machine tools was 65 percent in four of the six all-Union associations and output-capital ratio was 2.9 rubles/rubles; for the other two the corresponding figures were 79 percent and 1.9. For 17 enterprises of the other sector a regression dependence of output-capital ratio  $y$  (rubles/rubles) on the share of metal-cutting tools in primary technological equipment  $x$  (%) was obtained as follows:

$$\ln y = 16.56 - 3.756 \ln x. \quad (11)$$

The equation has the following statistical characteristics: paired correlation coefficient  $R = 0.777$ ; Darbin-Watson coefficient  $DW = 1.71$ ; Fisher criterion  $F = 22.9$ .

The principal changes in the stock of technological equipment in ferrous metallurgy and deliveries of such equipment are associated with the development of high-grade metallurgy and the production of output from the fourth and subsequent conversions. The ratio of subsequent conversion output (bent and shaped pieces, calibrated steel, tin, and other) to the production of finished rolled products rose from 2.5 percent in 1966 to 4.1 percent in 1975. The proportion of cold-rolled sheetmetal in finished rolled metal rose from 5.6 to 6.9 percent in this same period [3, p 246].

It follows from Table 3 that the development of technologies for the production of progressive types of metal output had a decisive impact on the decrease of the output-capital ratio and rise in capital-intensiveness of output from ferrous metallurgy. The explanation for this must be sought in both the decrease in return per unit of rolling equipment which is observed for new technology and in the rising cost of metallurgical equipment.

In ferrous metallurgy the rise in the quality of output is not fully compensated for by the rise in prices, which leads to a decrease in the output-capital ratio. Thus, each ruble of additional capital investment in the production of heat-resistant rails and calibrated steel is only 45 percent compensated for by the corresponding increase in volume of output measured by cost, while the compensation for the production of bent sections was less than 20 percent [6, p 202].

The increase in the proportion of cold-rolled sheetmetal in the production of finished rolled products demanded additional expenditures for purchase of equipment and increasing the stock of equipment because the production of one ton of cold-rolled sheetmetal requires roughly three times as much equipment as the production of hot rolled products.

There is a trend toward an increase in the weight of rolling mills per unit of productivity. Thus, the new wire mills weigh three times as much as the old ones, while their productivity is just 1.5 times greater. At the same time the cost of one ton of rolling equipment is rising. In just 1972-1973 the cost of one ton of rolling equipment in constant 1 July 1967 prices rose eight percent. As a result the cost of mills per unit of productivity increased even when assets were defined in constant prices. For example, the replacement costs of light-section rolling mills (the linear 280, continuous 250, and continuous high-speed 250) are increasing in a ratio of 1:6:10, while the productivity of these mills is rising at a ratio of 1:3:4 [6, p 199]. Thus, whereas the development of no-waste technologies in machine building produces savings of metal and investment, the factor of decreased metal-intensiveness by increasing the production of progressive types of metal output is capital- and asset-intensive for ferrous metallurgy.

The principal construction technologies have developed toward increasing the proportion of industrial methods of construction and turning the sector into an assembly sector while raising the level of factory readiness of building materials. These technologies aim at conserving live labor.

In the period under consideration this direction of technical progress was realized principally by the development of the production of reinforced concrete construction components and parts. According to figures of the comprehensive balance, the building materials industry spent 33 percent of all capital allocated for equipment purchase to buy equipment for the production of reinforced concrete articles in the Eighth Five-Year Plan, and 38 percent in the Ninth Five-Year Plan at a time when the stock of equipment for the production of reinforced concrete articles accounted for just 20 percent of the active part of assets in the sector. The stock of equipment for reinforced concrete components increased roughly 1.7 times in the

building materials industry during the decade under consideration, while in construction it tripled; growth in the active part of fixed capital was, respectively 2.2 and 2.6 times. The stock of electric welding equipment in construction increased more than 4.5 times. As Table 3 shows, certain industrial-type technologies that are being developed in construction are both asset- and capital-intensive for the construction complex.

Mechanization of earthmoving and hoisting-transport work was decisive in the decrease in the output-capital ratio and growth of capital-intensiveness in construction (see Table 3). Thus, the level of mechanization of earthmoving work in construction rose from 94 percent in 1965 to 98 percent in 1975 [3, p 186]. Raising the mechanization of earthmoving work to such a high level demanded substantial investment in earthmoving and grading equipment, for the purchase of excavators, bulldozers, scrapers, and graders. The stock of earthmoving equipment in construction increased 3.8 times as compared to a general increase of 2.6 times in the active part of fixed capital. The growth in purchases and the stock of earthmoving and grading machinery was the result not just of an increase in the level of mechanization of earthmoving work but also the rising cost calculated per unit of power. Thus, in 1966-1974 the cost of a unit of capacity for single-scoop excavators rose roughly six percent, while for trencher-rotary excavators it rose 30 percent, for bulldozers 40 percent, and for scrapers 80 percent [7, p 44].

In addition to the change in technologies for production of primary output, the output-capital ratio and capital-intensiveness of the investment sectors were affected by automation, development of the production infrastructure, environmental protection, and expansion of the material-technical base of science.

The process of automation caused a 1-2 percent drop in the output-capital ratio in the sectors of the investment complex under study during the decade. As Table 3 shows, this factor did not have a large impact on the output-capital ratio of these sectors as compared to other factors. The impact of automation was reflected much more strongly in growth in capital-intensiveness. It was particularly notable in machine building where the share of expenditures for purchase of instruments, automation equipment, computers, and automatic lines in capital investment for equipment was higher than in other sectors. In the Eighth Five-Year Plan this share was eight percent, and in the Ninth Five-Year Plan it was already about 12 percent. As a result, the capital-intensiveness of machine building rose roughly 10 percentage points during this decade, and the automation factor itself had a decisive impact on change in capital-intensiveness in the sector.

Development of the production infrastructure is largely related to construction of enterprises in undeveloped regions. It is natural that, as can be seen from Table 3, this factor was reflected primarily in a decrease in the capital-output ratio and growth of capital-intensiveness in construction itself, as well as in ferrous metallurgy. As for machine building, which is chiefly concentrated in industrially developed centers, development of the infrastructure did not have a significant impact on the output-capital ratio and capital-intensiveness.

Notable among the other technological factors that affected change in the investment indexes of efficiency was the development of ecology-conserving technologies, especially in ferrous metallurgy where these expenditures are about five percent of capital investment. Three-quarters of the expenditures go for protection of water resources, and the remainder to protect the air basin. The development of ecology-conserving technologies caused an increase of up to two percent in capital-intensiveness during the decade. Expenditures for environmental protection are much lower in the other sectors.

The development of science-intensive sectors, above all machine building sectors, demands an increase in capital investment for the fixed capital of science. This investment cannot fail to be reflected in the output-capital ratio and capital-intensiveness of the sector because return from it involves a time lag and has a different kind of efficiency than investment in the production apparatus of the industrial sectors. Calculations show, however, that even in machine building the impact of this factor on the output-capital ratio and capital-intensiveness is slight because the share of capital investment in science is still very small.

Among the other technological factors that affect the decrease in the output-capital ratio and rise in capital-intensiveness are development of the decentralized method of producing spare parts and performing equipment repair. During the decade under study this process manifested itself primarily in an acceleration of growth in purchases and the total stock of metalworking equipment in ferrous metallurgy, construction, and the building materials industry. As a result of this, the output-capital ratio in these sectors dropped by 1-2 percent during the period under consideration while capital-intensiveness rose 2-4 percent.

The replacement of technologies was not entirely the result of preferential development of progressive types; the second cause was liquidation of obsolete production sectors and compensation for this withdrawal by introduction of new assets. Between 1965 and 1975 the share of withdrawal of active assets for the entire investment complex and each of its four sectors decreased both with respect to availability (from 20 percent in the Eighth Five-Year Plan to

15 percent in the Ninth) and capital investment (from 26 to 22 percent respectively).

The result of the decrease in the share of capital investment to replace assets being withdrawn was slower growth in full capital-intensiveness compared to net capital-intensiveness. Whereas the net figure increased 1.22 times in the investment complex in the Ninth Five-Year Plan compared to the Eighth, the increase for full capital-intensiveness was 1.16 times.

The methodology we have presented and the results obtained with it permit additions to the existing conception of the impact of technical progress on the output-capital ratio and capital-intensiveness of production proposed by A. I. Notkin, which has been elaborated in the works of other Soviet and foreign investigators, in particular the works of J. Kendrick [1, pp 5-6, 48-49].

According to the view of A. I. Notkin, the effect of technical progress on the output-capital ratio manifests itself differently in the two stages of machine production. In the first stage, when technical progress is accomplished primarily in the process of initial replacement of manual labor, the output-capital ratio of production inevitably rises. In the second stage, when the predominant process is replacement of less productive equipment with more productive equipment and live labor is conserved not only by direct replacement of manual labor by machines but also by indirect replacement, conditions are created for a decrease in the output-capital ratio.

The investigation we have made shows that the introduction of mechanization of manual labor does not explain even half of all the changes in capital-intensiveness and the output-capital ratio in any of the sectors, while in machine building and ferrous metallurgy the processes of mechanization had a very small impact on the return of investment in the period under analysis. The conclusion that mechanization of manual labor, although it does have a marked impact on the formation of the asset-intensiveness of production, is not a key factor today in explaining changes in this index is confirmed by the analysis of capital-intensiveness and the output-capital ratio for the sectors of the fuel-energy complex in [8]. In the current period when mechanization has either been virtually completed as is the case with earth-moving work in construction for example, or will be completed in the near future (hoisting and transport work), or has achieved the limit that is technically and economically feasible at this time (mechanization of assembly in machine building), the asset-intensiveness of output continues to grow. Under conditions where sectors are moving into the second phase of machine production the increase in asset- and capital-intensiveness occurs first of all under the influence of change in the structure of the technologies that provide growth in the productivity of labor that has already been mechanized and

improvement in working conditions, in particular by automation and conserving other material and energy expenditures. Development of the production infrastructure demands additional specific capital investment. This factor is especially significant for sectors of the construction type because they are moving into the undeveloped eastern parts of the country. Full investment to compensate for worsening production conditions of extraction is increasing sharply for the extraction sectors of industry [8]. In the future asset-intensiveness will increasingly experience the impact of growth in investment for environmental protection measures and development of the technical base of science.

In addition to this, change in asset-intensiveness within the framework of particular technologies affects change in the cost of a unit of equipment capacity and square meter of production area. As the analysis showed, the impact of the factor of rising cost per unit of equipment capacity on change in asset-intensiveness is tangible, but it is not, despite the widespread opinion, determining at this time. It is the structure of technologies that dominates the process of formation of the output-capital ratio and capital-intensiveness.

The views of certain economists such as S. Kuznets, N. Kal'dor, and G. Khausteyn, who consider growth in asset-intensiveness an inevitable result of technical progress [1, pp 62-63], appear to be mistaken. The capital-intensiveness of output may be reduced by purposeful shaping of the structure of technologies in the sectors of material production with due regard for faster development of capital-conserving technologies.

The asset-intensiveness of the output of the investment sectors may be reduced, for example, by increasing the proportion of many progressive shaping technologies in machine building while reducing simple cutting and the stock of metal-cutting machine tools, development of centralized equipment repair and factory production of spare parts, the oxygen converter method of steel production (instead of open hearth), and the use of cast-in-situ concrete and reinforced concrete in construction while reducing the share of prefabricated reinforced concrete components. The questions of the effect of fundamentally new technological processes such as no-blast metal production and non-machine methods of working design materials in machine building deserve special investigation.

An additional way to reduce asset-intensiveness is to lower the cost of a unit of output by the development of specialization in machine building, reducing the weight of machines and construction components, and using progressive materials and design and planning concepts.

Further study of the impact of technologies on the output-capital ratio and capital-intensiveness of output should be based on study of

changes in capital coefficients for particular technologies taking available experience into account.

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